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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Twenty-second Annual Meeting, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF THE SECRETARY,
DELAWARE, O., Feb. 16, 1906.

The Twenty-second annual meeting of the Ohio Gas Light Association will be held at Cincinnati, O., March 21st, 22d and 23d.

The President, Mr. Donald McDonald, of Louisville, Ky., will call the meeting to order on Wednesday, March 21st, at 9:30 A.M., in Assembly Hall at the Grand Hotel, the headquarters.

The following will be presented at the meeting:

"Question Box," edited by Mr. Henry L. Doherty, New York City.
"Wrinkle Department," edited by Mr. W. E. Steinwedell, Cleveland, O.
"Novelty Advertising and New Business Methods Department." edited by Mr. George Williams, Madison, Wis.
"Progress Department," edited by Mr. Alfred E. Forstall, New York City.
"Information Bureau," edited by Mr. H. L. Olds, Lincoln, Ills.
"Bureau of Forms and Records," edited by Mr. D. W. Low, Alliance, O.

REPORTS OF COMMITTEES.

"Question Box Revision Board," by Dr. H. B. Harrop, Chairman, Milwaukee, Wis.
"Uniformity of Gas Meters," by Messrs. Chas. H. Dickey, Baltimore, Md.; Paul Doty, St Paul, Minn.; H. C. Abell, New York City.
"Flow of Gas in Pipes," by Messrs. J. D. Shattuck, Chester, Pa.; W. H. Hammon, Pittsburgh, Pa.; J. O. Johnston, Columbus, O.; H. A. Carpenter, Pittsburgh, Pa.
"Standard Sizes for Coke," by Mr. C. W. Andrews, Duluth, Minn.
"Standard Methods of Testing Fuel Gas Appliances," by Messrs. Henry L. Doherty, New York City; F. W. Stone, Ashtabula, O.; John Franklin, Cincinnati, O.

PAPERS.

"Compressing Gas," by Mr. William M. Welch, Columbus, O.
"Some Economic Relations Between Public Lighting Corporations and the Public," by Mr. W. H. Gardiner, Jr., Boston, Mass.
"Standard Methods of Construction and Operation of Coal Gas Benches—No. 3," by Mr. W. A. Baehr, St. Louis, Mo.
"Readiness to Serve Method of Selling Gas," by Mr. W. B. Tuttle, Long Branch, N. J.
"Producer Gas," by Mr. Henry I. Lea, Pittsburgh, Pa.
"Instructions to Gas Distribution Employees," by Mr. H. M. Robb, Peoria, Ills.
"Protection of Service Pipes," by Mr. R. C. Congdon, Atlanta, Ga.

An opportunity will be given any of the speakers at the meeting to correct their remarks before leaving Cincinnati, but not after, as all of the reports will be turned over to the printer immediately after the meeting.

The Grand Hotel is conducted on the American and European plans, and the following rates have been secured for the meeting: American plan, $3 to $10 per day; European plan, $1.50 to $7 per day.

The Grand has recently been entirely refurnished, and the management hope to entertain all of the Association and will put forth every effort to make the members comfortable. The most satisfactory

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quarters are always obtained by writing in advance to the hotel people.

The new 2-cent railroad rate in Ohio will be effective before the meeting so that transportation will be greatly reduced for all those who go to Cincinnati.

Although arrangements have not been entirely perfected, I am at this time, through the courtesy of Mr. James E. Stacey, Chairman of the Local Entertainment Committee, permitted to announce the following entertainment.

For the ladies, Wednesday afternoon: Special palace cars to Rookwood Pottery, Eden Park, Art Museum, and tea at the "Country Club."

Thursday afternoon: Special palace cars through Avondale to Norwood, visiting United States Playing Card Plant, Bullock Electric, Globe Wernicke and other large manufacturing plants.

Thursday evening: Theater.

For the gentlemen, Wednesday evening: Smoker at the Business Men's Club.

Thursday evening: Beefsteak Dinner in the cellar of one of the celebrated Cincinnati breweries, and such entertainment as usually goes with this feature.

The privileges of the Business Men's Club, which is but a few blocks from the hotel, will be extended to the membership.

The Secretary will furnish with pleasure application blanks for membership and any other information which may be desired relative to the meeting.

T. C. Jones, Secretary.

BRIEFLY TOLD.

Notes.—

The Greeley (Col.) Gas and Electric Company has arranged for the construction of a water gas set to take the place of the present oil gas apparatus. It is more than possible that the Company will also have to make a sensible change in its storage plant.

The proprietors of the Rotary Meter Company, whose advertisement will be found in our advertising pages, informs us that among the engineering and constructing firms who have installed rotary meters may be mentioned Messrs. R. & J. Dempster, Robt. J. Dempster & Sons, Crossley Bros., Humphreys & Glasgow, the Economical Gas Apparatus Construction Company and the Dellwick-Fleischer syndicate.

The following gentlemen are named as the incorporators of the Newport (N. H.) Gas Light Company, which is capitalized in $75,000: Seth M. Richards, Samuel Lewis, Wm. F. Richards, John McCrillis, M. W. Tenney and Jesse M. Barton.

The Concord (N. H.) Light and Power Company is now comfortably installed in its new and handsome office quarters at No. 90 North Main street. Manager Morrison invites every gas man who has to visit Concord to "look over place."

The proposed gas plant at Opelika, Ala., looks to be a go. Mr. Arthur R. Law is the owner of the franchise; and it is specified that the selling rate shall not exceed $1.50 per 1,000 cubic feet.

The Winchester (Va.) Gas and Electric Company, according to the Baltimore *Sun*, which was owned by some of the interests connected with the Consolidated Gas Company, of Baltimore, has just elected Dr. William S. Love, of Winchester, as President, and John H. Cunningham, of Westminster, Md., General Manager as well as a Director. All the other officers and directors are Winchester men. The Company recently sold its electric business to the Winchester and Washington City Railway Company, effective June 1, when it retires from that branch of the business. It will continue in the gas business and has announced a reduction in price. Mr. Charles H. Dickey, of the Consolidated Company, is a leading stockholder.

"W. S.," writing from Detroit under date of the 11th inst., says: "At a recent meeting of the Portage Lake Gas and Coke Company, held in Detroit, a general reorganization of the Company took place. The old name of the Company was changed to that of the Houghton County Gas and Coke Company. The capitalization of the new Company has been increased in order to provide for extensions and other improvements now contemplated. Officers of the new Company were elected as follows: President, Robert H. Shields; Vice-President and General Manager, J. T. Lynn, of Detroit; Secretary and Treasurer, E. T. Berger, of Detroit; Assistant Treasurer, Herbert S. Baer. These gentlemen, together with M. C. Getchell and James Fisher, of Houghton county, and I. T. Schloss, J. R. Bussley and G. T. Hance, of Detroit, constitute the Board of Directors of the new Company."

[Official Report.—Revised by the Secretary.—Continued from Page 448.]

THIRTY-SIXTH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held at Young's Hotel, Boston, Mass., Feb. 20 and 21, 1906.

First Day—February 20—Morning Session.

Discussing the Paper by Mr. S. J. Fowler.

[For the text of the Fowler Paper, see Journal, March 12, p. 444.]

The President—Gentlemen, you have heard a most interesting and pleasing paper. It ought to provoke discussion certainly. There should be many questions that would be naturally asked of Mr. Fowler. I trust there will be no delay in beginning. Mr. Fowler will be very glad to answer anything. There is a question from the Question Box which might be considered at this time in connection with the paper just read, which is:

"Second year's results with deep purifiers?"

Mr. Fowler has stated what he has done, what plans he has put in operation, and indicated what he might expect. Mr. Gifford might tell us something concerning the second year's experience with deep purifiers.

The Secretary—We have so-called deep boxes. We have about 5 feet of oxide in each layer, in a duplex box. Last year we only made 2 changes, and at the last change we found the oxide considerably hard.

The President—What is the natural make for a period?

The Secretary—The first change this year was 95,000,000, and up to the present time we have run 67,000,000. Our annual output was about 183,000,000.

The President—Are conditions in those boxes such that they are similar to those referred to by Mr. Fowler?

The Secretary—Decidedly not. The oxide does not run down through the bottom.

The President—You have the same hole?

The Secretary—Yes.

The President—But the oxide does not fall?

The Secretary—The hole in the bottom of our box I think is 10 inches in diameter. It is a round opening. It is quite a little circumstance to get the hole through. We have have to take it down with a bar, dig up from below and break down from above. After we get it through there is no serious trouble in getting out the oxide.

The President—But it does not run out?

The Secretary—No.

The President—That is our experience. We have the same depth of purifiers, 11 feet, with two 5-foot layers, and when the door is open the oxide does not run out.

Mr. Fowler—How large is your door?

The President—Ten inches, and the openings through the trays are the same. Have any other members had experience who are willing to state it?

Mr. B. J. Allen—I would like to ask Mr. Fowler, in case he had trouble with one retort, as he has a cross connection from one mouthpiece to the other, what he would do.

Mr. Fowler—That will almost always be the case. So far in going out we have burned off the two retorts which are paired at the same time. The two retorts, lying on the same level in the same bench, are ordinarily exposed to the same conditions, and the carbon forms in them at about the same rate, so that we burn off the two retorts at once.

Mr. Allen—If you have a stopped pipe on one retort doesn't that throw the other retort out?

Mr. Fowler—Yes, it would throw both out, certainly; that is, if it were in the standpipe. If it were in the cross connection, of course, only one would be thrown out. But we have not been troubled so far with any stopped standpipes, except on the vertical 8-inch pipes, and they have troubled us very little.

Mr. Nettleton—May I ask Mr. Fowler a question? As I understand his description, he breaks the coal at his dock, that is, all the lump coal; therefore he stores broken coal. Probably before doing that he went into consideration of the effect of storing broken coal. In looking that up did he find any evidence that would tend to show that broken or fine coal deteriorated faster when stored than lump coal?

The President—Mr. Fowler, can you throw any light upon the question of Mr. Nettleton?

Mr. Fowler—There must be many men here who are much more

familiar with the coal business than I am, but I confess I was moved to do this by my own experience, which was that I have used coal that I knew had been undisturbed 10 or 15 years in our shed, and it seemed to be just as good as the new coal that was coming in. I don't see why, if coal is kept dry and not exposed to the influence of moisture, it should deteriorate; that is, our gas coal.

Mr. McKay—Your shed, Mr. Fowler, is made I believe of hard pine posts?

Mr. Fowler—Yes.

Mr. McKay—Have you made any provision for protecting them from an incipient fire?

Mr. Fowler—No; not as yet.

Mr. McKay—Do you consider that this system of removing the coal from the shed with the electric trolley adds to the fire hazard appreciably?

Mr Fowler—It is my impression that a system of removing coal by which the top of the heap is attacked, and by which you can dig down in any one place, diminishes the fire hazard. Ordinarily, if there is a fire in the coal in the shed, you have to take hold of that, digging from the side, and if the trouble is in the middle of the coal heap there is an immense amount of coal to be removed before you can get at the fire, whereas on this principle you can go almost anywhere in the shed and dig right down till you get to the fire and carry that coal out doors and remove it.

The President—Perhaps Mr. Pease, of Lowell, can enlighten the Association upon the experience there. As I understand, that is stored and broken.

Mr. Pease—We are storing coal broken, and have not had any trouble in my time. Perhaps Mr. Hintze could tell you of some trouble they had previous to my time.

The President—Mr. Hintze is here, and he will tell us if there was any trouble. Some years ago there was a fire in Lynn. If I remember, the old shed was constructed with the wooden posts inside. Is that so, Mr. Prichard? Did that have any effect upon the matter?

Mr. Prichard—We had a fire in the same shed that we have now, 4 or 5 years ago. It started around one of the hard pine posts. We had quite a good deal of trouble. It cost us several hundred dollars to move the coal out and put out the fire. The coal was not crushed before it was put in.

The President—Have you done anything to remove the pine posts, or do they stand now just as they were, unprotected?

Mr. Prichard—We analyze our coal now a little closer than we did before.

The President—And you have not protected the posts with concrete?

Mr. Prichard—We have not protected our posts, except in that way.

The President—And have had no fire since?

Mr. Prichard—No fire since.

Mr. Gardiner—I think Mr. Fowler's point of the dry storage of coal was very well taken. We hear a great deal of the deterioration of coal and the heating of coal, but examination frequently almost always shows that moisture in large quantities is present. As I understand Mr. Fowler's system, he crushes the coal before it goes into his shed, and there it is entirely protected from moisture. Some years ago I had considerable experience with a certain grade of coal which was very sensitive. I found that a large amount of moisture produced a great deal of deterioration, comparatively speaking, whereas, as far as I could tell, there was no deterioration where the coal was kept dry. And the same would apply to the heating of the coal. When moisture was present in quantity the coal would heat very rapidly; when it was dry it did not heat rapidly; it was not so susceptible. I think the point on that dry storage was very good.

The President—In taking the coal from the barge to the shed, is it exposed to the atmosphere at all?

Mr. Fowler—Yes; that is all open.

Mr. McKay—I don't see the plan and height dimensions of the retort house. Will Mr. Fowler state those, and inform us as to the anticipated capacity of the installation?

Mr. Fowler—The retort house inside is approximately 60 by 78. The height from the floor to the tie-rod of the trusses is 23 feet 8 inches, I believe. We expect to have a capacity of at least 1,000,000 feet from the 6 benches. I tried them last Sunday, but for only 2 hours, because we have no station meter which we can use continuously on our own gas, and we were making at the rate of about 332,000 a day from 2 benches. We don't think we are running them where they ought to be run. This hand work is very different from what we hope to get when we have the machinery.

The President—What is the type of furnace?

Mr. Fowler—It is a Weber furnace.

Mr. Shelton—Mr. President, this paper is particularly of interest to me because it is on the same lines as two or three conclusions that I have reached as to the best general type of equipment for a medium sized retort house. This plant of Mr. Fowler's is not in a city of 10,000,000 daily output, neither is it in a small town. It might be called a retort house of intermediate capacity and dimensions I have had 2 different places in the last 18 months where I have had to design equipment to get the same general results—that is, doing away with hand labor as far as possible, and without running into a tremendously expensive investment to get conveniences for quick working and, of course, as the final object, cheap production. I want to go on record as very strongly concurring with the general lines that Mr. Fowler has adopted and is working upon. In other words, I believe, for instance, that one of the best plans for getting coal from the coal storage into the retort house is through some system of electric traction. It seems to me that such an overhead plan of picking up coal has a great many merits, and must give a good deal of a setback particularly to the older type of link-belt and chain conveyors. Further, on the question of fire hazard, I think the fact of having a lot of tunnels under the coal bed, where air can get into the beds of the coal, is not a good thing. At any rate, you have an elasticity with an overhead, single track, monorail, telpher or electric carrier, for less investment than almost any other scheme. You can run an I-beam round the roof of your coal shed, and can pick up coal from underneath almost anywhere for very little expense. You have great surface area. Of course, that system is overhead. The coal is brought into the retort house on the upper level, so that gravity is used to do the rest. The coal should then fall into some kind of machine to charge the retorts. It seems to me that then the finish to the ideal scheme is to have another machine which will push the resulting coke out and through on the opposite side of the bench, so that the steam and the dirty work, so-to-speak, are one side of the retort house only. I have so designed two plants which are now finished. One is making gas, the other is under heat. One of them has 8 benches of 6's, with 10 feet through retorts, and on the front of the benches we have a De Brouwer charging machine for throwing in the coal. The coal is taken from little overhead bins in the roof, which carry 24 hours' supply, a daily storage so-to-speak, as against the main storage in the coal shed. The coal falls from these bins, is whirled or blown or thrown into the retorts, is carbonized, and is pushed out again by a comparatively simple electric ram, which makes one push and retracts the ram. The coke is on the far side and may be taken out by whatever form of conveyor seems naturally the most expedient for the particular works. The whole scheme is to get the coal up in the air to begin with, then let gravity do the rest, and use a simple appliance for throwing it into the retort, a simple one for getting it out in the form of coke, so that 2 or 4 men can handle quite a sizable retort house and avoid the expense of the large, cumbrous and expensive, although admirable and capable, type of machines that are involved in the very big retort house, which the medium sized companies cannot go in for. One of the plants that I speak of is at Staten Island, N. Y. That has 20-foot retorts. In the course of 60 days we expect to be running in full shape. If any of you gentlemen are in the neighborhood, and would like to see a scheme of that sort carried out and working, you are abundantly welcome to drop in at any time and see it. I wanted to ask Mr. Fowler one or two questions. First, you have 20-foot retorts and through retorts, as I understand it. Have you a furnace on each side of the bench, or does one furnace take care of the entire heating?

Mr. Fowler—Here is a plan of the furnace setting you see, on the right and center of the book, a plan of the whole bench setting.

Mr. Shelton—That was rather obscure in the printing, and I could not quite make it out.

Mr. Fowler—There are furnaces at each end of the bench.

Mr. Shelton—The retorts are operated as through retorts at present, even though by hand charging. You said that you expected ultimately to put in the projecting machine and to push out the coke by power.

Mr. Fowler—No; they are through retorts, but they are operated from each side, just as if they were not through retorts.

Mr. Shelton—Do you have a partition on the middle of the retort so as to make two retorts 10 feet long?

Mr. Fowler—No. We have standpipe only at one end of the retort.

Mr. Shelton—When the charge is drawn in that way do you open up both ends from opposite sides and take the coke out?

Mr. Fowler—Yes.

Mr. Shelton—So that a draft of air can go through from one end to the other?

Mr. Fowler—Yes.

Mr. Shelton—Do you find that that draft of air diminishes the scurfing that is necessary? The question of scurfing was raised a moment ago, and I was under the impression that inclined retorts which, when they are charged, are opened up at both ends, require very much less scurfing than those which are closed at one end. With the draft of air burning out just a little bit each time the charge is made you should get less accumulated carbon. It seemed to me that even on a horizontal retort, where the inclination of course is nothing, being on a horizontal plane, the tendency would still be for the air to draw through after opening, and to reduce the scurfing to a minimum, and I was interested to find if you had less scurfing with your arrangement than heretofore.

Mr. Fowler—We have been running now a little over 2 months. We have only scurfed the retorts once—the whole of them. I think 2 of them have had 2 scurfings. We skip 2 charges—that is, it takes 8 hours to do the scurfing.

Mr. Shelton—I wanted to get at the probable amount of carbon deposit, for the reason that it would have some effect on pushing the coke through with a ram. If you have a ram with a push-plate at the end, approximating the cross section of a retort, and you let the carbon inside accumulate and push a little bit too hard, you may jam hard and have your whole setting go to pieces inside, and the ability of the draft to keep down the carbon deposit inside would greatly enhance the ability to use the mechanical pusher, in my judgment. So that I am interested to find out. I would like to ask Mr. Gifford and Mr. Prichard if in their inclines they find much less scurfing than they used to find in their old horizontal retort practice.

Mr. Prichard—We have practically no scurfing whatever. We lose, I should say offhand, 8 hours on one retort, during a month in scurfing out 5 benches of nines. Is that about right, Mr. Anderson?

Mr. Anderson—I think, Mr. Prichard, 6 hours would cover it.

Mr. Shelton—Do you have carbon for sale?

Mr. Anderson—Practically no carbon.

The President—How is scurfing?

Mr. Anderson—Practically no scurfing whatever. I think we have had 1 retort on carbon in 6 hours in the last 2 months.

The President—In the line of your statement the point had occurred to me to ask what, in your judgment, is the minimum make in a works that would be warranted in installing the mechanical machinery to which you refer for charging and discharging? How small the output per annum?

Mr. Shelton—Any works that gets down to a 2-man power basis per shift—that is pretty small, comparatively—for the reason with those 2 men, while you are paying interest on a charging machine, and perhaps a coke pushing ram, you will have capacity for the indefinite future almost of such a company without putting on any more men, and you will very much improve the operating condition.

The President—So that with 1 bench of sixes or 1 bench of eights a company would be warranted in installing the machinery?

Mr. Shelton—I did not quite mean it that way. I mean with as many benches as 2 or 3 men on a shift would handle I think one is justified in considering a simple form of power apparatus. There are even simpler affairs than I have been referring to. On the other side there is an apparatus known as the "Rapid Manual" charging machine. It is a skeleton rig, in which scoops are filled in advance on the floor between charges and then they are lifted by power. A little, light rope cable hoists them up, instead of taking physical effort on the part of the men, and they are pushed in, turned over and withdrawn in almost a minute's time to each retort, and are filled between charges and are ready waiting for the next.

The President—What is the output approximately of each of these companies io which you refer?

Mr. Shelton—The output in Staten Island is approximately 200,000,000, very close to the output that Mr. Fowler speaks of. The output in a Western works that I was speaking of, which has 8 benches of 6's, is something like 125,000,000, and I am contemplating designing a plant this spring in a city that will put out about 400,000,000. So that I have been a good deal, for the last couple of years, into this question of the best reasonable equipment for a medium sized retort house, and I have certainly come down to the point of, not expensive machinery of $10,000 and $15,000 cost each, but machines in the range of $2,000 cost each, as being warranted.

The President—Could any company sending out 90,000,000 or above well afford to install this machinery?

Mr. Shelton—I thoroughly believe so; yes, sir.

The President—Are there any other questions that any member would like to ask, or is there any further discussion upon this most interesting paper? Another question has been asked Mr. Shelton, that is, the effect of packing the coal in the retort with that projecting machine? Does it settle evenly? Is it distributed the entire length satisfactorily? Is the retort itself cleared easily?

Mr. Shelton—In all my experience; yes, sir. My experience so far has been short; it has not been running long on that basis; but my observations were somewhat extended before I concluded to purchase such equipment to commit myself to that method of working, and were to the effect that the results were marvellously uniform and satisfactory.

The President—Eminently so were they?

Mr. Shelton—I think that our most excellent friend Mr. W. H. Bradley, from New York, told this Association two years ago as to the behavior of a De Brouwer machine, which was the first one of the projecting type (of which there are four now in the market), and I think the records of this Association will show that he spoke very highly of its work and invited the whole Association to be his guests in New York and visit it there.

The President—As we remember that, and Mr. Bradley is here, he will be very glad to tell us as to the experience of the last two years.

Mr. Bradley—Gentlemen, as an honorary member I was keeping perfectly quiet. I don't think I have anything to add to the remarks that I made 2 years ago. The De Brouwer projector is working excellently well. All of the repairs that we have had on it for 2 years amounted to a matter of about $10 or $15 for a new belt.

The President—That is remarkable.

Mr. Bradley—The question that was just asked about the pushing of the coke out I may refer to. I have recently been making some experiments in that direction. I think it will be found in using the 20-foot length retort and pushing the coke out that it will be necessary to make the retort wider at the outlet end, the same as the inclined retort now. I think that will come without question. In regard to piling coal, although I was not asked—

The President—We shall be very glad to hear you upon that.

Mr. Bradley—I will say this: My experience is that all coal that gets on fire is fine, damp coal. While with coal piled under cover the danger of fire is minimized, still we don't always get our coal dry. The coal comes in wet from the mines, almost necessarily, it is piled wet, and whether it is stored under cover or stored in the open, if it is fine and of a sulphurous nature, it will burn. In our new plant on Long Island which we are building I considered that question quite at length, and finally decided to put my crushers between the coal store and the retort house, because I was afraid—I use the word advisedly—to store the coal after it was crushed. The handling must be done by electricity; there is no question about that. Electric power has come to stay, and is with us. On the subject of inclines I am not quite as strong as I was 2 years ago. I rather think the De Brouwer and the cheaper charging machines are going to push the inclines to the wall. However, we have now coming on a vertical retort. That may solve the question again. We want to get away from the horizontal if we can.

Mr. Gifford—The last question did not quite carry as I suggested. The idea was the effect of the carbonization of the charge after it had been placed in the retort by the projecting machine, as compared with the machine which merely drops it out of a scoop. Is it or is it not a fact that a charge of coal projected in takes longer to distil?

Mr. Bradley—I beg your pardon. I think I got away fpom that. That was the question I was asked to answer, wasn't it?

The President—That was only one of them, Mr. Bradley.

Mr. Bradley—I think that is a fact. We were running 4-hour charges before using the De Brouwer projector, and now we find better results in working 6-hour, although we put in more coal. I think we could burn off the amount of coal that we use per charge in 4 hours if we put it in with a scoop, but putting it in with a projector it does pack a little and requires a little more time. By increasing the amount of coal up to even the packing point we get about as much gas out of the retort and get along perfectly well with the charging.

Mr. Lamson—I desire to move a vote of thanks to Mr. Fowler for his very interesting paper. [Seconded.]

Mr. Shelton—I was going to make an amendment that he be compelled to give us another paper next year, telling how everything went after completing!

The President—It is moved and seconded that a vote of thanks be given to Mr. Fowler for this very interesting, instructive and well prepared paper that has been read. Are there any remarks upon this motion?

The amendment was adopted, as was the basis of the original motion.

The President—You not only have the privilege and pleasure of preparing another paper, Mr. Fowler, but you have the vote of thanks given unanimously.

THE REPORT OF THE COMMITTEE ON NOMINATIONS

was then presented as follows, by Mr. Wm. E. McKay:

Mr. McKay—The Committee instructed me to report as follows:

For President—William McGregor.
" *Vice-Presidents*—W. G. Africa and Joseph E. Nute.
" *Directors*—William H. Snow, Benjamin J. Allen, T. H. Hintze, D. D. Barnum and Charles A. Learned.
For Secretary-Treasurer—N. W. Gifford.

ELECTION OF OFFICERS.

The President—Gentlemen, you heard the report of the Nominating Committee for the officers for the ensuing year. What is your pleasure concerning the method of their election?

Mr. Shelton—I move that the Secretary be instructed to cast a ballot for the entire slate, and that the polls be closed.

The Secretary—I amend the motion by the substitution of the name of Mr. Shelton.

The President—We will vote, then, upon the amendment to the original question, which is that Mr. Shelton be empowered to cast the ballot for the Association and that then the polls be closed. [Adopted.] Mr. Shelton will cast one vote for the Association.

Mr. Shelton—This is one of the jobs that I am pleased to do, and I can say it most sincerely. I first officially declare the polls closed—that was a part of my motion, sir—and I next officially deposit a ballot which you will please interpret as a ballot for the unanimous choice of the most excellent, and the very good people who have been named to run this Association for the succeeding year.

The President—The result of this ballot indicates the unanimous choice of the following gentlemen, who will serve during the ensuing year:

President—Mr. William McGregor, of Pawtucket, R. I.
Vice-Presidents—William G. Africa, of Manchester, N. H., Joseph E. Nute, of Fall River, Mass.
Directors—William H. Snow, Benjamin J. Allen, Thomas H. Hintze, D. D. Barnum and Charles A. Learned.
Secretary and Treasurer—N. W. Gifford, of East Boston.

THE PRESIDENT-ELECT'S RESPONSE.

Mr. McGregor—Mr. President and Gentlemen, it is indeed an honor to be chosen President of the New England Association of Gas Engineers; a very great honor. When we consider the personnel of the presidents who have hitherto served you, why it is more impressive. I certainly feel a good deal like a man who understands that some are born great, others achieve greatness, and others have greatness thrust upon them. I certainly am in the latter class. I wish to thank you one and all for the goodwill shown, and pledge you to do my best to make the meeting of the coming year as attractive as possible. We gas corporations are pretty well advertised. Never before in the history of the country have corporations been in the lime-light of publicity as they are to-day. Consequently the better the papers the better we are fitting each other for the better discharge of our duties to the public and of the corporations that we represent. I thank you again, gentlemen for the honor conferred.

(To be Continued.)

[ABSTRACT.—CONTINUED FROM PAGE 452.]

FIFTH ANNUAL MEETING, WISCONSIN GAS ASSOCIATION.

HELD AT THE HOTEL PFISTER, MILWAUKEE, WIS., FEBRUARY 14-15, 1906.

FIRST DAY—AFTERNOON SESSION.

The President introduced Mr. I. F. Wortendyke, of Janesville, Wis., who read the following paper on the

ADVANTAGES OF WATER GAS:

Local conditions enter so largely into the factors which determine the best methods of manufacture that it is impossible to say which method is the better, except for a definite locality. Each method possesses advantages not possessed by the other, and the final determination of which method will be chosen will depend on the relative cost of materials at the particular place under consideration. As a general proposition, the smaller the plant the more apparent are the reasons for manufacturing water gas only. The first cost of installation is admittedly less in case of water than coal gas for the same output. Less houseroom is needed for the manufacture, less storage capacity for the gas, and less storage capacity for fuel, which mean, in addition to a less cost for buildings, also less cost for land needed for the plant. The fact of needing less fuel for the water gas plant means less dependence upon transportation lines for the maintenance of the operation of the plant, and it is not to be disputed that the less dependent a plant is upon such transportation lines for its raw material the better it is. Suppose a town of 10,000 inhabitants, whose maximum sendout reaches 100,000 cubic feet per day, or an annual sendout of say 25,000,000.

For water gas:

Allow.....	50	pounds generator fuel.
	25	pounds plant fuel.
	75	pounds fuel per 1,000.
Oil, 7 pounds per gallon.	35	pounds oil.
	110	by 25,000 = 2,750,000 pounds or 1,375 tons per annum.

In the case of the same output for coal gas. Allowing 10,000 cubic feet per ton of coal carbonized, for 25,000,000 cubic feet, this will require 2,500 tons of gas coal or very nearly double the total tonnage needed for the same output of water gas. This does not take any account of the coke produced, for which, of course, a local market may be found, although this local market for the coke and other by-products of coal gas manufacturing has often to be created, which means more work and more worry for the management.

In regard to storage capacity, an expensive item in any plant, with water gas one can afford to run with much less holder capacity and still be reasonably safe than with coal gas, on account of the comparatively short time required to take up the duplicate machine, it being taken for granted that all plants are provided, where water gas only is made, with a duplicate set for use while re-checkering and re-lining the other, and also for emergency cases. Another reason for larger holder capacity in coal gas plants is this: For sake of illustration, let us suppose the town of 10,000 inhabitants to be furnished with a coal gas plant of 3 benches of 6's. During the summer months, when the output is at a minimum, 2 benches would supply the needed gas. As the season advanced and the consumption increased it would become necessary at some period to fire the other bench, and this necessity would arise before the additionally demanded output reached the capacity of another bench, but still the third bench would have to be fired, and in order to maintain economical working it would have to be run to its full capacity. So that, supposing the output to be 90,000 cubic feet per day, and taking it that the 3 benches would produce say 112,000 cubic feet per day, this would leave an excess of 22,000 cubic feet for which storage capacity must be provided. This provision for extra storage capacity for surplus gas manufactured would, of course, not arise in a water gas plant, where the amount made depends entirely upon amount needed.

An important feature of the water gas plant is the few men needed to run it, compared to the number necessary to run a coal gas plant of the same size. I think all will admit that much less danger from strikes and like causes exists where a few men are employed. Where a comparatively large number of men are at work the danger of a strike always exists, and when it comes it is hard to at once find men to fill the places of those going out. Taking again the water gas plant in the small city we have used by way of illustration, it is possible, in case of trouble at the works, for the superintendent, with a few men from the office, to manufacture all the necessary gas until other men be found to take the place of those who have quit, which in these days is often a very decided advantage. In the matter of cleanliness and neatness of appearance, water gas plant is far ahead of coal gas, and if it should be necessary to locate the plant somewhere near the center of the town, these considerations may become an important factor in the determination of which process will be used. Also, the gas itself from the water gas plant is of a higher candle power and burns with a stiffer and brighter flame, although these latter considerations are of not so much importance at the present time, owing to the almost general use of the incandescent burner. In larger works, say in cities from 40,000 inhabitants and upward, the ideal plant would be a combination water and coal gas. With the water gas it is much easier to keep the candle power up to a high (sometimes by law specified) standard, than with coal gas alone. I have already mentioned the advantage of being able to exactly make the gas needed for the daily output, thereby saving storage capacity.

The installation of an auxiliary water gas machine for a coal gas plant avoids the necessity of firing another bench until the output de-

manded equals the output of the entire bench. Also, in the case already specified, with the possibility of a failure of transportation lines, either from strikes, blockades or any other cause, to furnish the needed fuel for the coal gas plant, with very much less fuel, water gas could be made until the difficulty was remedied. In the case of the combination plant, a raise in either the price of oil or the price of coal would not necessarily unduly increase the cost of gas in the holder, as that portion of the plant could be run for which fuel could be provided most economically. For instance, if the coal goes up, make water gas; if oil goes up, make coal gas. A striking example of the benefit to be derived from the combined plant is furnished by a city of 300,000, where coal gas has actually been made so cheaply that, from the sale of by-products, the books of the company have shown a credit before a foot of gas has been sold. And yet this same company has recently installed its third complete water gas machine. The wisdom of so doing was shown during the past season, when, owing to unexpected conditions of the river, it was unable to unload its coal barges, and the city would have been without gas had it not been for the auxiliary water gas plant.

I have not brought figures to show that water gas is superior to coal gas, nor do I believe they can be made to do so, except for definite, specified localities. For, as I said in the beginning, local conditions govern entirely, and what may be the ideal method for manufacturing in one city will by no means fulfil these ideal conditions for another, and it may be that for a third city these same conditions would best be filled by a combination of the two methods.

Discussion.

The President—I will call upon Mr. Douglas to open the discussion.

Mr. Douglas—I do not think I am the right man to start this discussion, but perhaps Mr. Wortendyke may think that I am because I feel a little disposed to criticize the paper. I do not understand what he is driving at. Do you use water gas in Janesville?

Mr. Wortendyke—Yes.

Mr. Douglas—I understood that you did; and why water gas instead of coal gas?

Mr. Wortendyke—Because the plant is there.

Mr. Douglas—Is it cheaper? No. Then why use it? We are in the gas business for the purpose of making money, and also to make as cheap gas as possible for the use of the consumer. I have often wondered why they made water gas at Janesville when it costs more money. An estimate of the prices paid for the material used in the manufacture of water gas will show that it costs about 50 cents per 1,000. Now, there is another point. He starts in with a town of 10,000 population, and ends up with a city 30 times that size. The comparison is made with the larger city against a 10,000 hypothetical town. You see what I mean; a comparison of the larger city with a town of 10,000 inhabitants is not worth much; is it? I think that the paper is subject to the criticism that it contains no demonstration; it is not based upon any experience. He simply says in reference to a larger city that the water gas proved to be a good thing because they could not get their coal barges alongside their docks. I will leave it to any man that ever ran a plant in a city of 10,000 inhabitants whether he would like to run 2 coal gas benches and an auxiliary water gas plant to help out those 2 gas benches; if he does that and then tries to keep his Welsbach lamps in order, he will have his hands full. The writer of the paper says in another place "The by-products mean more work and more money for the management." I sympathize with that statement. In running an ordinary water gas plant, in a city of 10,000 inhabitants, if the superintendent does not watch every gas maker, and watch the machine, not only the quantity of oil that goes in per 1,000 feet, but the condition of the water gas machine itself, he will have his candle power go up and down even on the same figures, and we all know it; and if it goes a little bit "fat" you get smoke in your mantles, and that means further worry and trouble for the management. Anybody making coal gas escapes that difficulty absolutely; and it is a big one, is it not Mr. Wortendyke?

Mr. Wortendyke—We don't get smoke in the mantles ordinarily.

Mr. Douglas—But you have to watch the candle power very carefully to avoid that. You also talk about gasholders. Would you not have to have an extra storage holder? You would not want to make 15,000 or 20,000 feet of water gas every day, and then mix it into your holder, would you?

Mr. Wortendyke—You can do it.

Mr. Douglas—But it would be practically a difficult thing without two holders?

Mr. Wortendyke—Yes.

Mr. Douglas—Now after you have got through with it—that is the whole meat of the question—do you recommend that a gas company operating in a city of 10,000 population should take up the combination system and install it? There is no such recommendation in the paper, I admit that—it simply says, "What do we think of it." I have told you that unless I have arguments presented to me, I shall adhere to my conviction against the water gas plant, for my whole experience is against it. I do not like a tentative paper on the practical question, and a comparison of a town of 10,000 population with the experience of the larger city has no bearing whatever on the question. You will excuse me for speaking thus earnestly, especially on a subject on which I may be mistaken, for it seems I was mistaken a short time ago in my discussion of a certain point with Dr. Harrop.

The President—Mr. Douglas may be pardoned for the enthusiasm he displays, even if he does not know anything about the subject.

Mr. Patten—Mr. Wortendyke's paper has taken as a comparison a coal gas plant putting out 25,000,000 cubic feet of gas per year. That case is identical with that of our plant. Further along he says that the maximum output is 112,000 cubic feet per day, and it takes 3 benches to make this. I want to say that I do not consider it necessary to take 3 benches to do this. We can make enough gas with 2 benches to take care of that same output. We have been running about 26,000,000 a year with a holder capacity of about 47,000 cubic feet—that is the working capacity of it—and there are days when we put out 115,000 cubic feet; but the paper is of special interest to me for the reason that it will be necessary in a short time for us to increase the capacity of our plant—not only the holder capacity—by installing a new water gas set or a couple of new benches. In order to do this we will have to lengthen our retort house about 30 feet. Now this will take up about 50 per cent. of the room that we have for storing coal—that is, if we put in two new benches, and we will also have to enlarge the capacity of our holder. This holder is so arranged that an extra lift can be added to it without putting it out of operation. On the other hand, if we install a water gas set it will not interfere with the present arrangement of our plant, with the exception that we will be compelled to purchase a piece of property across the street for the erection of a relief holder. Now the question that presents itself is this: Which will be to our advantage, to enlarge the present holder capacity and add to the number of benches already in use, there by cutting down our coal storage space, or installing a water gas set with the relief holder across the street. I have no doubt there are a good many gentlemen present who can give me valuable views on this subject.

Mr. Kimball—At Kenosha we are making water gas only, and changed over from coal gas on account of the cheapness of oil; but if the price of oil goes up the situation may become different. We had a plant which was growing right along, and the question arose as to whether we should put money into our works or should push our main system. We did the latter. We have a holder about the size described by Mr. Patten, supposed to hold 50,000 cubic feet, but it will not go above 45,000. Our maximum sendout last October was 265,000 cubic feet from that 45,000-foot holder, and we have two 5-foot 6-inch water gas sets. One of the difficulties we have had with water gas is that it has not been as applicable for gas engines as coal gas. The price of oil this year is down, and it is more to our advantage to make water gas than to make coal gas. In the running of the water gas plant, from a practical point of view, we have found it necessary, where we were selling a large amount of industrial gas, to watch the carbonic acid gas very carefully, because our industrial customers noticed a variation of 2 or 3 per cent. very quickly.

Mr. Scott—I think it is simply a question of whether the interest on the added investment for the coal gas plant, reduced to cost per 1,000 cubic feet, is greater or less than the difference between the operating cost of making water gas and coal gas. If the interest on the added investment in the coal gas class, reduced to thousands, is less than the difference between the cost of production of water gas and coal gas, it will pay to put in the coal gas plant.

Mr. Patten—I wish to say, in explanation of my remarks, that our present coal storage space will take care of about 3,000 tons. We have good, deep water right back of the works, with good dockage, and what we have been figuring on is whether it would pay to use that coal storage space or to purchase the property across the street, put up a relief holder and install a water gas set.

Mr. Kimball—I understand, at Waukegan, Ills., where they had a combination plant, they in the last year discontinued the manufacture of coal gas.

Mr. Crawford—That is true. We installed a new water gas set within the last 10 days, and have made a duplicate of it so we have sufficient water gas capacity to take care of all our customers very easily.

Mr. Douglas—You don't make mixed gas?

Mr. Crawford—Not at present, though we have done so. In the paper just read some of the reasons given I quite agree with, one of which is that labor troubles are considerably reduced, and, of course, the price of oil has in the past year been quite reasonable. Further, as somebody has said, Milwaukee coke is good coke.

Mr. Eastman—I do not see why the manager of a gas company should look for the easy end of it. If he is going to make money he should make the gas which is most profitable and best. He is there to adjust troubles and keep things straight.

Mr. Crawford—I do not believe anybody here who spoke of trouble means that he is looking for a snap; that he does not want to work. Labor troubles cost money frequently. As for making coal gas and putting it in the holder at a low price, it is possible to put waier gas in the holder for less than the low price.

Mr. Douglas—It is a question of the price of oil, for which we have been asked to pay as high as 5 cents.

Mr. Kimball—Our Kenosha price for oil is 3.23, as against 3.85 cents for the last year; but we have bought it as low as 1.85.

Mr. Douglas—It is absurd to bring up the question of a strike in a town of 10,000 inhabitants, where the gas works will not be employing more than 3 laborers, getting perhaps $2 a day each. It is a frightful thing to contemplate, and a very great difficulty to guard against, is it not!

Mr. Brown—I can hardly claim present experience with this subject; but a number of years ago, when I was with the American Gas Company, I had about a dozen small plants, in every one of which but one we had coal troubles. The delivery during the winter months was very bad. Railway companies confiscated our coal. We had every reason not to make coal gas. We had insufficient holder capacity also; but my predecessor had put in water gas plants in several of the worst locations. I will say that in the several years I was with the Company we did not make a foot of water gas, and that our local managers who had the troubles were very glad indeed to follow that programme; that is to make coal gas always when they could and make water gas only when absolutely necessary, because we believed the variation in the gas and the difficulty for providing first-class service for all kinds of consumers, were greatly increased by the water gas; so that in order to give equally good service it was necessary to spend more time at their works than they did with the coal gas. The only argument advanced in favor of water gas here to-day, that seems to me to be good, is the one which Mr. Scott offered tentatively. "If you have not the money and must have the increased capacity, as has been the case with many small companies, water gas will usually figure out very much cheaper per unit of capacity than coal gas." You may get along without additional holder capacity, and may tide the thing over until you can afford coal gas—but water gas is really nothing but a makeshift. The question raised by Mr. Wortendyke, as to the variation in the cost of coal and oil, does not seem to me to be important. Our experience has been that when oil goes up coal goes up with it, and when gas coal goes up coke appreciates in value, and the net cost of the gas is not seriously affected by fluctuations in the raw material. I was going to mention something which Mr. Douglas has also stated, which is this question of labor troubles in a small plant. In a large plant that is a serious matter, but, where you can replace with a gang of 5 or 6 men, a retort house of 40 men, that is something to be considered, but in the small plant where your water gas plant requires 2 men, and your coal gas plant has perhaps 3 or 4, I do not think it is very serious. In the case mentioned here, where they had to increase their capacity and there was a question of coal storage and so on, I think most of these companies that have to take care of rail shortage, and in our case all through Wisconsin here, where they have to pay higher prices during the period after the close of navigation, if they do have to go outside of their regular supply, it is not a very serious matter; for the coal which you store up for that 2 months' supply is only handled once a year, and the net additional cost due to handling is less than 1¼ cents a ton on all the coal used, so it really amounts to nothing. You put the emergency supply aside, and perhaps you won't touch it at all; but at the works that will only handle it one year, it does not seem to me that spreading that out over your annual consumption is a very serious matter. In short, I think wherever possible you should stick to coal gas.

Mr. Crawford—Referring again to the question of retort house labor, it is not entirely the fact that you can replace these men; that is important. You might replace 6 men quickly enough, but a green man doesn't get results out of his benches. Don't you lose something there? When we stopped making coal gas we were running 3 benches and a small water gas plant. We threw down the benches, started up a new water gas set, and now have 3 men there who run that water gas machine.

Mr. Douglas—What would happen if they should strike?

Mr. Crawford—There are three different kinds of men; so they would not be governed by the same rules in regard to striking.

Mr. Wortendyke—I should like to say a word or two in closing. In reply to the charge of Mr. Douglas that my paper is somewhat tentative, that it does not state the respective advantages of the two systems, I would say I do not believe it is possible to determine arbitrarily which is the better system. I do not believe, unless you take a particular town and consider the cost of the various materials that go into the manufacture of coal and water gas, the labor conditions and everything else in that town that applies, that you can say which system has the greater advantage. In regard to labor troubles, the paper was on the subject of the advantages of water gas. Now a plant may have a certain advantage in a town of 10,000. That is one phase. It may have an altogether different advantage in a town of 100,000 inhabitants. I do not pretend to say that a strike in a town of 10,000 inhabitants is dangerous; but in a larger city the danger of a strike is real. There is another phase of a water gas set which appeals to one, and that is there is very much less liability to labor troubles. I did not say I particularly feared a strike in a town of 10,000 inhabitants, but the question is one of business policy. As far as the manager of a gas company being afraid of trouble is concerned, if the coal and water gas and all other things were equal, and water gas showed very much less worry than coal gas, I am perfectly frank to say I would take water gas. If there is any difference in money the manager should take the worry, but if other things are equal, why take the thing that is going to give him the most trouble?

A Dip Into the Question Box.

Mr. Corscot—On behalf of the President, and of the Association, I tender the gentleman thanks for the very valuable paper that he presented. It is suggested by the Secretary that as it is too late in the afternoon to take up another paper we may take up some of the answers to the questions in the question box. Mr. Haase, I believe, has a list of the names to whom the questions were sent.

Mr. Haase—The request sent out to the members that they send in questions for the question box was met with a considerable general and prompt response, and quite a number of questions were handed in that have been classified under their different heads, as in the question box, page 37. In sending out these questions, and in assigning them to a number of the different members of the Association, it was not the idea that the answers by these members were expected. It was the idea that some few might come prepared specially to take part in the discussion, so as to make answer to the question and discussion sure in each case; and we would not want it to be considered as the intention of the committee that only these questions that have been asked should come up before the convention.

The President—The first question is:

> "Is the so-called inverted light light of to-day any more efficient and durable than the ordinary vertical incandescent gas light?"

I will call upon Mr. Rutledge.

Mr. Rutledge—About the only thing that I can say in regard to inverted light has been our experience in the past year in the city of Milwaukee. We experimented with various types of inverted lamps and have been compelled to abandon them for the reason that they are not practical, as they did not take care of the varying pressure, and for the further reason that we had great difficulty and trouble in the carbonization of mantles, to such an extent, indeed, that we found it impracticable to put out the lamps among our consumers. For that reason we were compelled to abandon the lamp entirely. As far as the efficiency is concerned we were never able to make any test on the lamps themselves. However, from a commercial standpoint, our experience has been, of course, that the inverted lamp was best as far as throwing light is concerned, below the horizontal, and it is certainly the type of lamp which we are looking for, and this lamp is a step in the right direction in that respect. In order to get some of the tests which have been made by different men in regard to these lights, I took the liberty of referring the question to the Welsbach Company, and several tests were made by them. I received a letter from them giving these tests, and Mr. Little is now here with us, and I would very much prefer to have him give the result of those tests himself.

Mr. Little I did not come here expecting for a minute to speak in the meeting, but simply to hear what others had to say; but in answer to the question I might say that the greatest trouble thus far with the so-called inverted light has been the carbonization of the mantle. I

am very glad to say, however, that that trouble has been largely overcome. The reason an inverted light shows a greater tendency to carbonization than the upright burner is that the tube of the inverted burner becomes heated, really forming a chimney, and the draft develops a carbonizing flame. To avoid this it was necessary to introduce a large volume of air into the Bunsen tube. In the inverted burner, which was on the market in the past, it was impossible unfortunately to open the air ports wide, because when you lighted the burner, if the ports were opened wide the flame would flash back, and for that reason the only way to adjust the inverted burner was first to close the air ports, light the burner, wait till it was thoroughly heated and then open the air ports. That caused considerable trouble. However, an automatic device has now been devised to regulate the air draft properly. You may say, why not put a gauze in the Bunsen tube to prevent flashing back. But that device has proven impracticable, as it obstructs the free flow in the tube. The inverted light has very many advantages. Its efficiency is very high, it is shadowless, there are no metal parts below, it is susceptible of great decorative possibilities and the difficulties in the way of their use are disappearing. One objection which has been made to these lamps has been the dropping of particles of incandescent carbon from the mantles, which has been perhaps somewhat dangerous, and in some instances underwriters have made restrictions against the inverted burner for that reason; but that difficulty has been overcome by the use of a glass protector which catches any particles of incandescent carbon that may fall from the lamp. I may say, indeed, that the inverted light of to-day is in a better commercial condition than the standard Welsbach burner of 5 or 6 years ago was.

Dr. Harrop—I have made tests of the candle power of two of these inverted lamps on a 5-foot consumption and have found them ranging from 35 to 85-candle power. The pressure used was the normal pressure occurring in the street, and the burner was regulated to give the best results. We did not use any glassware in connection with the lamps in making the test. These tests were made on one mantle in each case, and it sometimes happens that you get a bad mantle, so that the tests should not be accepted as final.

A recess was ordered until 10 A.M., Feb. 15th.

SECOND DAY—FEB. 15—MORNING SESSION.

The meeting was called to order by the President at the appointed time, who asked for the report of the Committee on Next Place of Meeting, which was in favor of Milwaukee. The report was indorsed and accepted.

REPORT OF COMMITTEE ON RESOLUTIONS.

Mr. Corscot—The Committee on Resolutions submits the following report:

Resolved, That this Association has heard with deep regret of the death of one of the most enthusiastic and faithful members, Mr. George MacMillan, of La Crosse, Wis., who for more than 30 years was employed in various departments of the gas industry, and who was one of the charter members of this Association.

Resolved, That the sincere sympathy of the Association be extended to the family of our deceased friend and fellow member in this their bereavement, assuring them that in our mutual loss a just and upright man and citizen has gone to a better land toward which we are all hastening.

Resolved, That a copy of these resolutions be forwarded by the Secretary to the family of our deceased fellow member.

JOHN CORSCOT,
EWALD HAASE,
DAVID DOUGLAS,
} Committee.

On motion of Mr. Wortendyke, seconded by Mr. Kimball, the report was adopted.

The President introduced Mr. F. M. Richards, of Madison, Wis., who read the following paper entitled:

CORNCOBS AS A SUBSTITUTE FOR SHAVINGS IN OXIDE PURIFYING MATERIAL.

In selecting a carrier for the active agent in a purifying material, it is evident that the highest efficiency will be maintained with that one carrying the greatest amount of the agent per cubic foot of the finished material with the least resistance to the flow of gas during the life of the material.

In the experimenting carried on along this line at Madison and Denver, very little difference was found in the relative merits of ground cork and ground corncobs. One point in favor of the cork is that it can be floated away from the oxide of iron and the sulphur impurities after it has become saturated to a point where it is of no further use in removing the sulphur. The cork can then be dried and used over again, and in this manner will last for a long time.

The initial cost of the cork, however, makes it almost prohibitive, and the cobs were found to be the more economical to use.

In Denver, they have entirely abandoned the use of sawdust and shavings in making up material, having substituted ground corncobs instead.

The cobs cost them 53 cents per 100 pounds in carload lots, delivered in Denver, the bulk of this cost being freight, as the cobs only cost about $10 per car. They are paying $7 per ton for good cast iron borings. From the above cost, we can figure that the material made up as follows is:

1 bushel oxide material, made up=2,150 cubic inches.....	
½ bushel corncobs = 7½ pounds at 53c per 100 pounds.....	$0.04
½ bushel oxide, 57 pounds at $7 per ton.....	0.20
Cost of grinding corncobs, oxidizing borings and mixing material	0.05
Total per bushel.....	$0.29

Shavings in Denver cost $10 per carload, plus $30 freight. This would run about 4 cents per bushel as the cost of the shavings, and as you cannot mix but 25 per cent. of the oxide to 75 per cent. of shavings, this would be 3 cents for ¾ bushel of shavings, and 10 cents for ¼ bushel of oxide, and allowing 5 cents for mixing the material, would make a total of 18 cents a bushel as the cost of material made up with shavings, and when you consider that it is only one-half as strong and that the shavings become pulverized and waterlogged, you will readily see that in the end it will be much more expensive than where ground corncobs are used as a substitute.

It has been demonstrated in actual practice that the life of material made up of shavings is only one-third of that where corncobs are used. One of the greatest advantages, however, in the use of cob mixture over the shavings is that it is possible to get a mixture of one-half of oxide, by volume, with the former, as against 25 to 30 per cent. of oxide with the shavings; hence, a correspondingly increased capacity in the same sized box; also a correspondingly higher purifying capacity per bushel. For example, in Denver they have 4 boxes having a capacity of 750 bushels each, or a total of 3,000 bushels, and are at present enabled to purify from 2 to 2½ millions cubic feet of gas per day with this small capacity, and often run from 9 to 12 days without changing a box. The coal carbonized, however, only contains about ¾ per cent. of sulphur.

In the experimenting at Madison, mixtures of 4 to 1 and 5 to 1 were used with excellent results, the 5 to 1 cob mixture throwing ¼ to ½ less back pressure than a 5 to 1 shaving mixture. The porous nature of the corncob mixture under compression makes it particularly adaptable to a design of box where material is carried at great depth, as in the Doherty-Butterworth box which we have in use. The shavings mixture in the lower part of box will sometimes become caked, and cracks form in places, causing short circuits, while with the cob mixture this trouble has not been experienced.

Rich mixtures, such as used in Denver, have not been tried at Madison, as we have only one-sixth the make and about one-tenth more purifying capacity.

Discussion.

The President—Mr. Richards' paper is before you for discussion. Will Mr. Wortendyke lead off?

Mr. Wortendyke—I hardly know what to say about corncobs as a substitute for shavings in oxide purifying material. The fact of the matter is, as Mr. Richards has stated, that shavings break up after a while, and if corncobs maintain their integrity, and if you can get more oxide of iron distributed over the mass than with the use of shavings, corncobs are certainly better. That is a case for trial to determine. I would like to know where he goes to get corncobs ground?

The President—He has a machine.

Mr. Richards—In Denver we bought our corncobs from the local feedmen, who ground them up for us.

Mr. Wortendyke—How finely are they ground?

Mr. Richards—The size of the different particles ranges from that of a kernel of corn to a marble.

Mr. Wortendyke—In making your mixture, how many pounds of iron do you use to a bushel of corncobs?

Mr. Richards—Half-and-half by volume. That mixture is one used by Mr. Malone of Denver. On account of his small purifying capacity

he has to get a very rich mixture. We do not use that exact mixture.

Mr. Wortendyke—That would be about 7 pounds of corncobs to 50 pounds of iron.

Dr. Harrop—That is the way I figure it up, and that is the statement on the first page of the paper.

Mr. Wortendyke—In a mixture of that richness do you get thorough oxidization by water alone?

Mr. Richards—We use copperas water.

The President—You can buy from the J. I. Case Company a corncob grinder for about $65.

Mr. Wortendyke—Made for that purpose?

The President—Made for grinding purposes; but it can be used for that purpose.

Mr. Walker—You can buy them from Hirsch Bros. Mnfg. Co., Reed street, Milwaukee—I don't know the price. Having occasion to recommend a party to get a grinder, he bought one 4 weeks ago and told me it was a corncob grinder.

Mr. Leuenberger—A firm in Columbus, O., makes a special corncob grinder, the price of which is $25 or $30 f.o.b. Columbus. I do not remember the name of the concern.

Dr. Harrop—I cannot speak with any intelligence on this subject, having had no experience with anything but shavings, but I always like to see a good definition, and Mr. Richards has given us a first-class one in his first paragraph, as to the duty to be expected from a carrier. I would like to see Mr. Richards take the other points he has brought out in his paper and add them to that definition, and thus make a complete one of a best kind of a carrier for oxide, and I think he would produce something pretty good.

The President—He demonstrates to some extent the reasons why he prefers the corncob mixture to shavings—principally on account of the fact that it does not absorb water to the same extent.

Dr. Harrop—I did not mean to criticize Mr. Richard's paper in the least. It is very short and concise; but I was throwing that out as a suggestion. The gas business needs definitions. Most industries having a scientific side have definitions, but the gas business has very few, and there is an opportunity for Mr. Richards to make a good definition of the best kind of a carrier, by taking the rest of the material from his paper, and adding it to that first sentence.

Mr. Eastman—I have had a little experience during the last couple of months in making oxide, and I did not think of corncobs, but I thought probably the objection would be that they would get soggy, soft and squeeze together. There would be more or less water in the box which would act on the cobs and in time cause them to decay, so that they would squeeze together. I would like to ask Mr. Richards in what state he has his iron. If he is going to put his iron in in powdered state, I do not see how he can get more than 20 pounds of iron into a bushel of cobs. I think that would be strong. You get better results with fine iron. The way the material is at present it is in coarse shape—a good deal like a lot of peas—and it should be ground into a fine powder and made very hard. The shavings should be saturated with copperas water, and then the iron should be added.

Mr. Richards—The iron mixed in this cob mixture, as prepared in Denver, is oxidized in the open air, according to Mr. Doherty's theory of letting nature do the work. It is brought down in a very fine condition and screened and mixed in that way, and as I understand it the mixture is made half-and-half by volume, and it carries very well.

The President—It seems to me that that is a pretty rich mixture. Would you not think so, Dr. Harrop?

Dr. Harrop—It is a great deal richer than we are in the habit of making, or than is commonly used; but I do not see any reason why it could not be made that rich. Of course, the iron will gradually work its way through the texture of the cob particles. It is put on a mixture, first, in the form of metallic iron borings and oxidizes, and if we find that the iron entirely permeates the body of the shavings, I do not see any reason why it cannot pass entirely into the body of the corncob, and I do not see why it should not be made that rich.

Mr. Harmon—Is the price at $7 a ton of recent purchase; or is that an ancient price?

Mr. Richards—I think that is the price up to within a couple of months in the past. I could not say positively.

Mr. Douglas—This question of oxide, speaking as a practical man and not as a chemist in this instance, is always a hazy proposition, and a great many of us, in fact most of us, are not clear about it at the present time. The first thing that you do is to get your iron borings. As Mr. Harrop knows, you then have quite a proposition on your hands to reduce all of those iron borings to actual metallic oxide.

Dr. Harrop—That is not reduction, but oxidization.

Mr. Douglas—I know that. I am not talking as a chemist. I am talking to practical men, and not speaking in exact chemical terms. Now, we want to get these iron borings into oxide. If you mix the raw iron borings with corncobs and then do a lot of oxidizing the heat will pretty nearly rot your corncobs before you get your work done. It is not done in that way. A great deal of the oxide that I have seen called oxide, I think the chemist on examination would still classify as metallic iron, not reduced. Another condition. In heating it goes, as Mr. Eastman and others have found, if we are not very careful, into a kind of nodular form which must be broken up, and in that shape, while it might be all oxidized, yet only the exterior of that nodule is of any use in the work. The interior part of the nodule does not do its work. Consequently that stuff must be reduced by mechanical grinding or trituration to a fine powder, if you are going to secure the ideal condition. If you reduce oxide of iron to a very fine powder, and mix 50 pounds of it to 7 pounds of corncobs, your are going to get a mixture which will resemble a clay, a pasty mass. You say that, having got the corncobs, to get the iron into them you add copperas water; but there is only a very small portion of that copperas anyhow that is oxide, but in that way you get it right into the mass. But I would rather have 10 pounds of oxide of iron than 20 pounds of metallic iron, to use for this purpose. Now, the manufacture of oxide itself, apart from the use of the material, is perhaps a good thing to take up, because I do not believe there are many people who thoroughly understand it, and I hope that point will be discussed.

Mr. Wheeler—I have made a considerable quantity of oxide, and I used to go at it the way Mr. Douglas has indicated, and I had but one serious difficulty, which was in the nature of the production of what is called "Christmas trees." I think the best way to make real oxide of iron is to take good, fine iron borings, let a little salt water run on it occasionally, keep it outdoors, and the open air will oxidize it. I remember at Madison 2 years ago I saw several barrels of beautiful oxide of iron made that way, simply by piling up the fine iron borings and letting a little salt water run on them occasionally. The air did the rest.

Mr. Eastman—At Madison this fall, talking with the works' foreman, I noticed they had a large pile of iron borings. He said every time they wanted any oxide they simply screened these borings and left them outside, but they did not get the oxide in as fine a shape as it could be secured by grinding it.

Mr. Richards—In the last batch we mixed up we took a set of smooth rolls and ground the oxide—that is, ground the stuff that was screened out from the piles. We have the piles arranged, as Mr. Eastman says, leveled off, and put the salt water on occasionally, and keep the pile oxidizing, and we screen over the pile, but we do grind the stuff after it is screened—that is, grind and reduce the residue.

Mr. Douglas—That is the point I wanted to elucidate; *i. e.*, having got it you have a lot of nodules, and you want the oxide in a different form. Therefore, you should screen it, which will remove the nodules. It pays to grind them and get them in a powdered form too. Another point I wanted to bring out in regard to the corncobs. I should suppose that the green corncobs, such as could readily be secured from a canning factory, would be too soft. Is that a kind of cob to be avoided, and do you want the dry, matured corncob?

The President—I should say the dry cob.

Mr. Richards—Yes, sir; we take the corncob from the ripe corn.

Mr. Douglas—Is not there some difficulty to get that, as the farmers are now doing their own shelling?

Mr Richards—We find no difficulty in getting what we need. I could not say what it would be in larger towns.

Mr. Douglas—The green cobs from the canning factory would not be suitable in your opinion?

Mr. Richards—I think not, unless they were thoroughly seasoned or dried out.

Mr. Douglas—Even then they would probably be slushy, would they not; or have you experimented in that regard?

Mr. Richards—No, I have not.

Mr. Douglas—The canning factories will furnish you all the cobs you want. In Eau Claire they would be very glad to furnish you 2 or 3 carloads a day, but I presume, from what I have heard, they could not be used for this purpose.

The President—The advantage of using these cobs, as compared with shavings, is that they will absorb a great deal more material than the ground shavings.

Mr. Douglas—But ultimately they have to be soaked again.

The President—That is just surface soaking.

The Secretary—I think the fine feature of the whole thing lies in the

fact that, with the use of corncobs, you have larger particles, and you are not going to pack your oxide, as you do when you use finely broken up shavings. Consequently you will not have the back pressure, which is the only reason why we change boxes at all. Now, if we can get corncobs to let the gas go through them, the cost of purfication is going to be reduced many times. That is the point which particularly interests us.

Mr. Richards—That is usually my experience with the purifying mixtures. When you use the shavings mixture you find, in looking it over, as it comes out of the box, that many of the shavings will come together, that their flat surfaces will come together, and not present a good porous surface to the flow of gas. The subject came to me a little late to do much experimenting, and I would have liked to make up some samples, and run some tests to show the difference in the two materials, but anyone can make those tests very easily by mixing up small batches and putting a flow of gas through them, then, taking the differential pressure, when you can very easily determine that there is at least ½ difference in the back pressure in the use of the two carriers under the same conditions.

On motion, a vote of thanks, was passed to Mr. Richards for his valuable paper.

(To be Continued.)

The Horstmann Gas Controller—Automatic Daily Variation of Lighting and Extinguishing.[1]

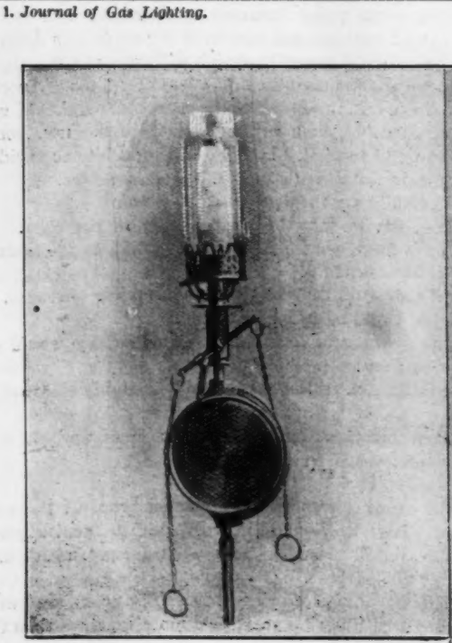
The past few years have been prolific in their yield of devices for the automatic and simultaneous lighting and extinguishing of public gas lamps, comprising clockwork and electrical arrangements, and other ingenious proposals in which the operation of valvular and other contrivances at the lamps is secured by a temporary increase of pressure at the gas works. The Patent Office has registered the birth, the ephemeral life, and the end of the majority of these arrangements between the application for Letters Patent and the publication of the complete specification. This is the record of impracticability. But the field for a really durable, reliable and simple automatic lighting and extinguishing appliance is a large one; and with that field ever present, the impracticability of the past does not retard those of inventive aptitude in this direction in the prosecution of work to procure their design.

A clever timing device, the combined work of the Messrs. Horstmann, of Union street, Bath, is the latest of promising arrangements; and if its special features are at once pointed out, it will insure consideration of the more detailed description, which follows.

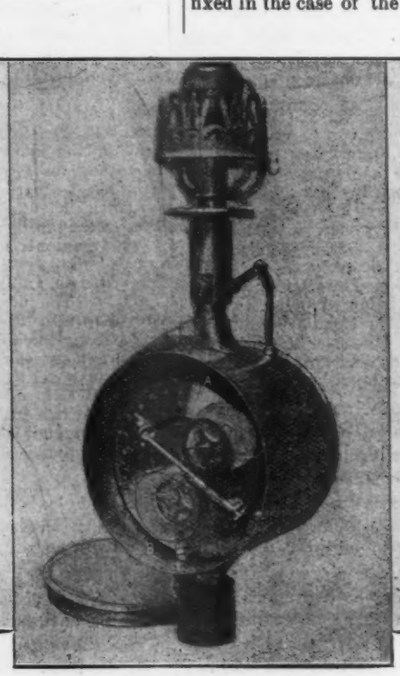
1. *Journal of Gas Lighting.*

In timing devices for lighting and extinguishing which have heretofore come before us, it has been essential—in order to make the necessary changes in the times of lighting up and extinguishing—to at short intervals visit each lamp, and especially adjust the mechanism for the purpose. This, of course, involves labor; and the less frequently the adjustment is made the greater the amount of gas consumption. It is the small economies per point of lighting which, accumulated from the whole number of lamps in a district, must, if at all, justify the application of mechanical or automatic means of doing the work. The Horstmann automatic gas controller needs no adjustment at all. By means which in the finished state are simple, but the attainment of which has involved skill and the labor of much minute calculation, the mechanism has been so devised that day by day, not with a daily uniform gradation but with the necessary time irregularity, the lever controlling the gas tap does its duty in opening and closing the gas way exactly at the right time. The mathematical precision that has been displayed in arriving at this result is without doubt worthy of the utmost praise. In this way only the winding of the clock periodically—say, every 8 or 14 days—is required. Nothing else is left to hand. In short, Messrs. Horstmann have aimed at, and (if the appliances stand the proof of trial in respect of durability and reliability) have achieved, the picking up of the littles that are lost in the time occupied in the work of adjournment and consumption of gas by predecessors in the same class. It is therefore a double step in advance. Moreover, as will be shown in the description, the tap can be worked by hand on any such emergency as fog, without interfering, in the slightest, with the action of the mechanism at the proper time.

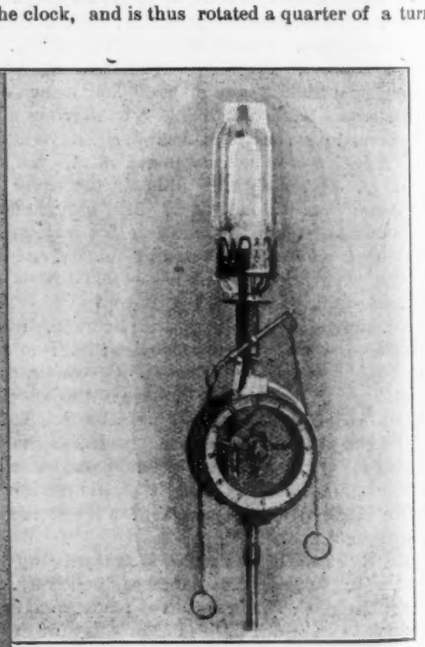
With this preface, we will proceed to briefly describe the mechanism, the general appearance of which is clearly shown by the illustrations, with their explanatory lines. It will be observed that the mechanism is all contained in a casing similar to that of an ordinary drum-shaped clock. The casing is only about 4 inches in diameter; and it is half encircled by the supply pipe conveying the gas from the service pipe below to the incandescent burner above. The tap of the burner is actuated by a connecting rod attached to a slide, which protrudes through the clock case, and, at the proper times, the slide is propelled upwards or downwards respectively for the lighting and extinguishing. The covers on both sides of the drum are removable. On removing the front one, an ordinary clock face is seen, and on this side the clockwork mechanism is wound and adjusted. As the clock face is provided with an ordinary pair of hands, the time can be accurately set and checked. On removing the cover from the other side of the drum case, the patent calendar mechanism for varying the times of lighting and extinguishing is exposed. This consists of a 24-hour dial plate, which rotates in unison with the hands of the clock. Projecting from its edge is a star wheel, which is made to come into contact with a cranked pin fixed in the case of the clock, and is thus rotated a quarter of a turn



Controller Closed as it Appears in the Lantern.



Controller Showing Back with Cover Off.



Controller Showing Front with Cover Off.

every revolution of the dial plate—that is to say, once in 24 hours. The shaft which carries the star wheel is provided with a worm or screw, which is geared to the two worm wheels pivoted on the dial-plate—one on either side of the worm. Rigidly attached to these pivoted worm wheels are two irregular shaped cams, which are made to represent the one the lighting, and the other the extinguishing chart; and, seeing they are changed daily, they are graduated accordingly. Ingenious as are the other parts of the mechanism, it is on the shaping of these cams that the most tedious and exacting work has been necessitated to make their operation conform to the gradual (but not day by day *pari passu*) change in the lighting up and extinguishing The functions of these cams is to impart a circumferential movement to the two "chart pins," which are seen on the dial plate pointing at *A* and *B*. This is accomplished by means of two other pins resting against the cams, each of which is connected with one of the before mentioned "chart pins" by means of a disk under the dial plate. It is by these "chart pins" that the mechanism which turns on and off the gas tap is discharged, and the time at which the discharge takes place is indicated by the figures at which they point. The cams are geared to make one revolution in a year, so that, save for winding, the apparatus (as already stated) requires no attention. We give an interesting chart

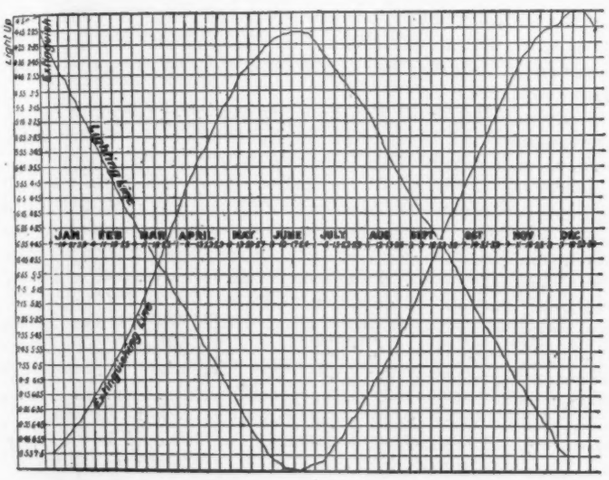


Chart Drawn from the Working of the Standard Controller Giving 3,650 Hours' Light per Annum.

(The controller can, of course, be made to work out any special chart.)

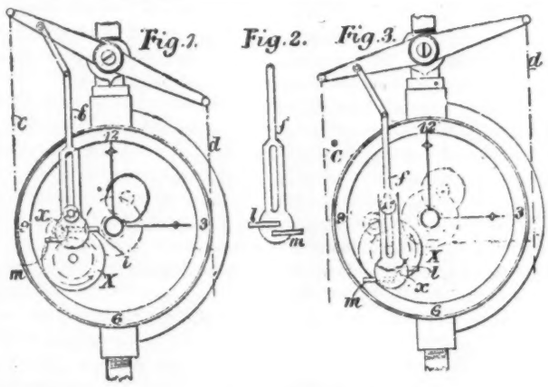
drawn from the working of the patentee's standard controller, giving 3,650 hours' lighting per annum. The controller can, of course, also be made to work out any special chart of a gas company or corporation.

With this description, an example may be given of the automatic time operation of the arrangement. Suppose the time for lighting up Feb 27 is 6.13, and for extinguishing 5.46, the automatic lighting and extinguishing will take place at the following times on the succeeding days:

Feb. 28.....	Lighted,	6.15	Extinguished,	5.44
March 1.....	"	6.16	"	5.42
March 2.....	"	6.17	"	5.41

And this continues from one year's end to another, without any attention other than the winding of the clock (say) once every week or fortnight.

Another patent comprised in this invention is for the hand movement of the slide which propels the tap. It was found necessary to render this capable of being moved by hand independently of the clock, so that in case of fog or the adjustment of mantles, the clock need not be interfered with. A short description of this improving feature will be of interest. On the front plate of the clock—behind the hands, and directly below the slide—is the wheel or disk *X*, from the face of which projects the pin *x*. The disk rotates in the direction of the arrow, so that the pin *x*, on its upward path, engages with the underside of the projection *l*, and lifts the bar *f* to close the tap. When the gas is turned off, the pin *x* comes to rest in the position shown in Fig. 1—that is free of the projections *l* and *m*. If the mechanism is left to itself, the gas will remain turned off until such time as the pin, on the continued revolution of the disk, shall engage with the upper surface of the projection *m*, and push it downwards into the position shown in Fig. 3,



when the gas will be thereby turned on, and the pin will again be clear of the projections *l* and *m*. The pin will remain in this position until the disk again revolves into the "turned-off" position. It is clear that, when the pin *x* is in either of its two stationary positions, the bar *f* is quite free; and the tap may be turned on or off by simply pulling the cords *c* or *d* respectively—the bar being able to slide up and down independently of the pin *x*. It is seen from this description that this freedom in hand lighting and extinguishing in cases of emergency is quite an auxilliary arrangement, and does not interfere in the least with the ordinary movement of the clock mechanism.

To sum up the principal claims for the invention, as advanced by the patentees:

(1) The device requires no adjustment for the varying times of lighting and extinguishing throughout the year; the only attention needed being winding once a week or fortnight.

(2) The calendar mechanism is easily set when erecting, and needs no further attention.

(3) If the hands point true time, the switching cannot vary.

(4) Great saving of gas is effected in the minute daily adjustment which automatically takes place.

(5) The valve being turned by direct contact with the mainspring of the clock, but independently of the time mechanism, certainty of action is insured, without retarding the hands.

(6) Any intelligent lamplighter can fix the apparatus.

(7) When the switch requires cleaning, it can be replaced by a spare one in 5 minutes.

(8) Tap can be worked quite independently of the mechanism.

Although the manipulation of street lamps is the principal destined use of these controllers, it can readily be seen that they have also great value in the lighting of shops which are under police observation at night.

In connection with the general subject, there has been, in dealing previously with lighting and extinguishing devices, such frequent reference to the saving of gas, to the prevention of destruction of mantles through the use of torches, and to the other economies attaching to the obviating of the double visit to each lamp post daily, that to traverse the ground again would be superfluous. The appliance is undoubtedly a distinct advance; and, so far as can be judged, it cannot be anything but positive in its action. There are other points upon which only time-trials will enable testimony to be made. No doubt, in these respects, further news will be shortly forthcoming, as trials are now proceeding by various gas companies, and notably by one of the large London companies.

New Iron Cored Instruments for Alternate Current Working.

By W. E. Sumpner, D.Sc.

In view of the acknowledged excellence of direct current instruments of the moving coil type, it is remarkable that little attention has been given to the construction of instruments on similar lines for alternate current working, the permanent magnet being, of course, replaced by an electromagnet, involving an additional circuit. The difficulties met with may be classified thus: (1) The induction density of the air-gap, or the current through the moving coil, may be of incorrect magnitude, owing to the direct or indirect effects of eddy currents, or to variations in the permeability of the iron; (2) the gap flux density and the moving coil current may not be in proper phase relation, owing to the phase

error introduced by the hysteresis in the iron, or by the influence of varying frequency and wave form on the reactance of the instrument circuits. The second class are the more important, those of the first only really affecting the calibration of the instrument.

Magnitude Errors.—Eddy currents can be rendered negligible by suitable lamination, while the effects of varying permeability are largely neutralized owing to the presence of the air-gap. But the latter has an important indirect effect, due to variation in the leakage factor for different magnetization currents. A way to overcome this last difficulty is to wind the magnetizing coil completely over the air-gap, and this condition is fulfilled in the author's wattmeter.

Phase Errors.—These have, especially in wattmeters, a more serious effect on the accuracy of the instrument than any likely variations in the field flux. Such errors arise from two causes: (1) Hysteresis makes the field flux differ in phase from the magnetizing current, and (2) the reactance of the moving coil circuit introduces a phase error. The former is slightly dependent upon the wave form, but not on the frequency, while the latter is greatly affected by both.

Iron Cored Instruments.—In an ammeter the magnetizing coil is placed in series with a very low non-inductive resistance, and across the terminals of the latter the moving coil is connected in series with a high non-inductive resistance. The magnetic flux and moving coil current will each be essentially proportionate to the main current, and hence the instrument can be calibrated as an ammeter. In the series magnet form of wattmeter the main current is used to produce the field, and the moving coil is connected across the mains through a non-inductive resistance. In a voltmeter the shunt magnet is excited by the voltage of the circuit, and the moving coil is put in series with a condenser across the same mains. The range can be altered by changing the condenser, or by varying the turns on either coil. In the writer's wattmeter a shunt magnet is used to produce the field, and the secondary of a current transformer produces a suitable current in the moving coil circuit. If the phase errors are made sufficiently small the instrument will act correctly, whatever the frequency or wave form, and however the voltage and current may be varied.

Ammeters.—Influences tending to cause error have little effect. Eddy currents can be made negligible with suitable lamination, and varying permeability only alters the calibration curve of the instrument. The phase error, whatever its value may be, is always the same for any particular current, and it can only have the effect of altering the calibration. In fact, in nearly all cases the error seems to be negligible with ammeters.

Ammeter Tests.—To test theoretical results, an ammeter of the pattern that has been indicated was tested in circuit with a Siemens' dynamometer. The instrument with direct current showed large hysteresis effects, but no difference could be detected with alternating current. It was next found that the error for varying frequency was extremely slight and the alternating current calibration was found to closely correspond with the direct current. As a result of the tests that were made, the following two conclusions were arrived at: (1) The calibration of the instrument by the direct current method yields a scale applicable for alternating current of any frequency and is such that the scale reading is proportional to the square of the alternating current producing the corresponding deflection; (2) the constant to be used with such a scale varies slightly with the current frequency in the case of the instrument tested. In the writer's opinion there can be no reasonable doubt that it is possible to construct accurate iron-cored ammeters for alternate current working, and that the indications can be made independent of the effects of hysteresis and of variations in permeability, frequency and wave form. The scale readings can also be controlled by shaping the air-gap in accordance with well known principles.

Voltmeters.—The electromagnet of a voltmeter must necessarily be used as a shunt to the mains, and as its inductance will be large the magnetizing current will, for all usual frequencies, be nearly in quadrature with the voltage producing it. This may appear to be a disadvantage, but as a matter of fact it renders the problem simpler. The torque is proportional to the square of the voltage, and this is true whatever the frequency or wave form, however leaky the condenser may be, and whatever the permeability and leakage characteristic of the iron. The instrument can be calibrated like an ordinary dynamometer voltmeter. To reduce the effect of the copper drop, the inductance of the coil must be increased, and this implies a narrow gap with increased flux density and a more sensisive instrument.

Wattmeters—The electromagnet for a wattmeter may be used in series with or in shunt with the mains, but in either case the phase errors must be greatly reduced. In the series magnet type it is difficult to reduce the hysteresis phase error to 1 per cent. and with shunt magnets it is much easier to bring about this result. Two iron cored wattmeters, due respectively to Dr. Drysdale and Signor Olivette, of Milan, have recently been described and are of great interest.

Wattmeter Tests.—A great many patterns of transformers for use with shunt magnet wattmeters have been designed, and the results of a good many tests show that the errors closely follow the theoretical ones that would be expected. In the writer's opinion there is no doubt that it is possible to construct these iron cored transformers so as to have a phase error well under 1 per cent. of a radian. In fact, it is almost obvious that if the laminated iron is used simply as a shield to totally surround an air core transformer the hysteresis phase error must become negligible. The total phase error of wattmeters with shunt magnets is easily reducible to less than 1 per cent. of a radian.

Phase Meters and Idle Current Ammeters.—If a wattmeter of the shunt magnet type has its moving coil current generated, not by a current transformer, but by tapping a non-inductive low resistance in series with the main current, the instrument will show no deflection on a non-inductive load. The theory of phase meters may be summarized thus: (1) Whatever may be the faults of phase meters, not one need be due to the presence of iron in the magnetic circuits; (2) phase meters for multiphase circuits, if once correctly calibrated, are accurate on balanced loads for currents of all frequencies and wave forms; (3) phase meters can be accurately calibrated for balanced multiphase loads by a simple direct current method of test; (4) the error of phase meters on unbalanced loads may be very large.

Electromagnets for Moving Coil Instruments.—The series form of electromagnet when used with direct current exhibits marked effects due to residual magnetism, magnetic history and varying permeability. In alternating current work investigation shows that only for one instrument, the ammeter, is the series magnet necessary; and that in this case the hysteresis effects cancel out while variations in permeability only affect the scale calibration. For the other instruments the shunt form is to be preferred. It is remarkable, however, that whichever form be in question the condition to be secured in the design is the same, so that the same instrument when suitably designed can be used indifferently as an ammeter, a voltmeter or a wattmeter. In the instruments as yet constructed the control has been made as strong as or stronger than that used in ordinary commercial permanent magnet moving coil instruments. It seems natural to describe as iron cored instruments those referred to in this paper, but it would be even more appropriate to call them air-gap instruments. We may regard the iron as a convenient means of lengthening the magnetic circuit till it is sufficient to inclose the winding without appreciably affecting the reluctance. In other respects the properties of iron are disadvantageous, and the behavior of the instruments is really determined by the gap, the design of the latter being the most important consideration.

A shunt magnet wattmeter as described has properties in sharp contrast with those of a wattmeter of the ordinary dynamometer type. In general behavior the instruments are very like permanent magnet moving coil instruments for direct current circuits. The scale can be calibrated by a direct current method, and this is a great advantage. The light moving system placed in a strong magnetic field possesses many good features, and there is ample margin of sensitiveness. Moreover, brass and other metal parts can be used in the immediate neighborhood of the moving coil field without affecting the accuracy.

The Feather River Electric Power Development.

Iron Age notes that the largest electric power project ever launched on the Pacific Coast, if not in the United States, has lately been announced. After two years of continuous effort, Brown, Wilson & Co., of New York and San Francisco, have succeeded in forming an exceedingly strong syndicate in New York, headed by Frank H. Ray, Edwin Hawley and Alfred C. Bedford, for the purpose of harnessing the waters of the Feather river in northern California, leading them through tunnels and runways and converting their energy into an electric current with a total of 300,000-horse power.

It is the plan of the company to construct a reservoir covering approximately 9,000 acres of the Big Meadows near the head waters of the Feather river. This reservoir will impound the run off of a drainage area of over 600 square miles, having an enormous capacity and ranking first in the entire world with the single exception of the great reservoir on the Nile at Assouan, Egypt.

From the reservoir the waters of the river will be conducted through a tunnel 1½ miles long into an adjoining valley, which will be con-

verted into a smaller reservoir, from the outlet of which will be a sheer drop of 2,000 feet, where the power house will be located. After being used at this point, the water will be again taken from the river a number of miles below, at the famous Big Bend Tunnel, built over 20 years ago by Dr. R. V. Pierce, of Buffalo, and associates, at an expense of $1,250,000, and here a second electric development will be made. The history of this tunnel project is an interesting one. It is 12,000 feet long, 16 feet high and 15 feet wide at a point known as the Big Bend, where the Feather river, after running 13 miles around a mountain and falling 600 feet, goes back to within 12,000 feet of the upper bed on the other side of the mountain. The purpose of the tunnel was to drain the 13 miles of river bed in order to extract the gold in the gravel, but after diverting the waters of the river its bed was found to be formed of boulders so huge that little progress could be made with the mining work, and the tnnnel was abandoned.

The stupendous nature of the electric project can hardly be comprehended until it is known that the power from these monster stations is expected eventually to run the railroads, light the towns and turn the factory wheels in all the cities of the Sacramento Valley and around the bay of San Francisco. The property is located near the head of the Sacramento Valley and the power generated will be transmitted by means of two lines 175 miles in length, so arranged that in case of accident to one an automatic switch will throw the current to the other. The projected line of the Western Pacific Railway runs parallel with the power system from the lower tunnel practically to the Big Meadows, where the reservoir will be located, and it is expected that power, light and heat will be furnished by the new company to all of the towns which will spring up along the line of that road. All property rights having been settled, work will be started immediately and pushed to completion as rapidly as human ingenuity and unlimited capital can do so.

The Eastern managers of the syndicate, who have purchased these extensive properties through Brown, Wilson & Co., are Frank H. Ray, of the American Tobacco Company; Edwin Hawley, a well known Eastern railroad man and a member of the Board of Directors of the Western Pacific, and Alfred B. Bedford, a prominent New York financier. Frank L. Brown, of the firm of Brown, Wilson & Co., has for many years been identified with the wire business, having been the former Pacific Coast Manager of the Washburn & Moen Mfg. Co., and later Pacific Coast Manager of the American Steel and Wire Company, and now connected with the Pacific Steel and Wire Company, of California, of which H. P. Wilson is President. It is stated that the development will be made in the most modern and thorough manner possible, and if the expectations of those interested are realized it will have a great influence on the development and prosperity of California.

Report of the British Commission on Labor Troubles.

Iron Age says that the report of the British Royal Commission on Trade Disputes and Trade Combinations has been made public. The commission was appointed in June, 1903, to inquire into and report upon the law relating to trade disputes. Fifty employers and 15 miscellaneous witnesses were examined. The trade unions took the position that the commission was likely to be prejudiced against them and refused to give any testimony, though from the tenor of the commission's report the representatives of labor had little to fear on this score. The recommendations are not in any sense hostile to unions, and in some particulars look to a relaxing of the stringency of some judicial decisions that have been given in the past few years. One important feature of the report is its emphatic support of the principle involved in the famous Taff Vale decision of the House of Lords. It had been freely claimed in recent political debates that in that decision the House of Lords reversed the intention of Parliament as expressed in the Trade Union act of 1871. The commission is firmly of the opinion that trade unions should not be restored to the status of irresponsibility they formerly enjoyed. On this point the report says:

The objections against disturbing the law as laid down in the Taff Vale case appear insurmountable. There is no rule of law so elementary, so universal, or so indispensable as the rule that a wrongdoer should be made to redress his wrong. If trade unions were exempt from this liability they would be the only exception, and it would then be right that that exception should be removed. That vast and powerful institutions should be permanently licensed to apply the funds they possess to do wrong to others, and by that wrong inflict upon them damage, perhaps to the amount of many thousand pounds, and yet not be liable to make redress oat of those funds, would be a state of things opposed to the very idea of law and order and justice.

Of the 5 members of the commission, which was composed of Lord Dunedin, Sir William Lewis, Sir Godfrey Lushington, Arthur Cohen and Sidney Webb, three united in the report. Sir Godfrey Lushington agreed to only four of the nine recommendations, and Sir William Lewis practically dissented from everything in the report, urging in his own report that, in view of the overwhelming evidence of the cruelty and oppression to which non-unionists are subjected at present, legislation should be considered to prohibit strikes against non-union workers. The legislation recommended by the majority report is in substance as follows:

1. To declare trade unions legal associations.
2. To declare strikes, from whatever motive or for whatever purposes (including sympathetic or secondary strikes) apart from crime or breach of contract, legal, and to make the act of 1875 to extend to sympathetic or secondary strikes.
3. To declare that to persuade to strike—*i. e.*, to desist from working apart from procuring breach of contract—is not illegal.
4. To declare that an individual shall not be liable for doing any act not in itself an actionable tort only on the ground that it is an interference with another person's trade, business or employment.
5. To provide for the faculative separation of the proper benefit funds of trade unions, such separation, if effected, to carry immunity from these funds being taken in execution.
6. To provide means whereby the central authorities of a union may protect themselves against the unauthorized and immediately disavowed acts of branch agents.
7. To provide that facultative powers be given to trade unions either (*a*) to become incorporated subject to proper conditions, or (*b*) to exclude the operation of Section 4 of the Trade Union Act, 1871, or of some one or more of its sub-sections, so as to allow trade unions to enter into enforceable agreements with other persons and with their own members.
8. To alter the Conspiracy and Protection of Property Act, 1875, so that "watching and besetting" shall not be prohibited unless the person whose premises are watched apprehends that violence will be done.
9. To enact that an agreement or combination by two or more persons to do or procure to be done any act in contemplation or furtherance of a trade dispute shall not be the ground of a civil action, unless the agreement or combination is indictable as a conspiracy, notwithstanding the terms of the Conspiracy and Protection of Property Act, 1875.

While the effect of the recommendations is much impaired by the fact that they are made by a bare majority of the commission, the report is significant of the same tendency to favor trade unions in legislative enactments that is much in evidence in the United States. The ease with which the unions might convert all funds into benefit funds and thus put their resources beyond the reach of suits for damages is suggested by the 5th Section, and Section 9 further safeguards the union treasury by making an action for damages impossible unless a crime has been committed. Section 6 opens another door to immunity by making the self-serving declaration of the general officers of a union sufficient to save the union funds, no matter what damage may have been inflicted by a local union.

For the most part the remaining recommendations of the commission are in line with decisions of courts in the United States as to the rights of workmen to strike or to induce others to strike. The question of picketing is not fully dealt with. Under existing decisions in Great Britain picketing may under certain conditions be dealt with as a nuisance and may be restrained by injunction, as has also been held by a number of local courts in the United States.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

"THREE STARS," writing under date of the 10th inst., from New York city, says:

To the Editors AMERICAN GAS LIGHT JOURNAL: It was the writer's good fortune to have attended the March meeting of the Illuminating Engineers' Society, and he was much impressed by several features. There were about 200 present, which made a splendid showing for so young a society and also one holding monthly meetings. The character of papers read and subsequent discussion were quite interesting, and a very general interest was shown throughout. It was easily apparent that, owing to newness, some of the "machinery" was not running with that degree of smoothness that will come later on, but a society

having the membership and attendance this one has will abundantly succeed, if its officers have the shrewdness to steer clear of advertising on the floor of its meetings, a danger that is especially peculiar to any new society. One time-saving device seemed admirable. The business of the society is apparently transacted by the "Managers," and a report of their actions was read at the beginning of the monthly meeting by the Secretary. Another noteworthy feature was the fact that a branch society is being established in Chicago, and one in Boston, and it was announced that, as soon as these bodies are formed, all papers to be read at the New York meeting will be sent to these branch societies, presumably so that in the three meetings the same papers may be read and discussed at the same time; and I infer that papers prepared by either of the branch societies would be treated in the same manner at the New York meeting of even date. By far the members of the society represented electric interests, with a good sized showing of those representing special lines in gas appliance manufacture, and a very limited number of gas men, probably less than a dozen. A list of the members was handed to each member as he registered (thus avoiding a roll call), which gave the names and business of each member, and which shows a total of 13 gas men located in Greater New York who are members, and 6 from the rest of the country.

THE Sullivan Brothers, general contractors, Flushing, N. Y., inform us that they have been awarded the contract to lay about 25 miles of mains and the services for the Jenkintown and Cheltenham Gas Company, of Montgomery county, Pa. Work under the contract will be commenced to-day.

WE are indebted to Mr. Edwin M. Walker, General Manager of the Bristol (Tenn) Gas and Electric Company, for the following announcement respecting the new rate schedule recently ordered: "From and after the 1st of March the illuminating rate is discontinued and all gas used will be billed at $1.25 per 1,000 cubic feet, with discounts depending on the amount of gas consumed. Hereafter the minimum monthly charge per meter will be 50 cents, from which there will be no discount. The following new scale of rates represents a considerable reduction in the price of gas, and we hope our consumers will appreciate our efforts to popularize the use of gas:

Quantity of Gas Used.	Gross, per 1,000.	Discount, per 1,0.0.
400 to 1,900.....	$1.25	.05
2,000 to 2,900.....	1.25	.10
3,000 to 3,900.....	1 25	.15
4,000 to 4,900.....	1.25	.20
5,000 and over.....	1.25	.25

Positively no discounts will be allowed unless bills are paid on or before the 5th of the month in which they are rendered. In cases where gas users have had two meters heretofore, one for illuminating and the other for fuel gas, the additional meter will be renewed by the Company at its own expense, and in the meantime but one minimum charge will be made. This does not apply to cases where conditions render it impossible or impracticable to make one meter do the work of two. The above rates bring gas within the reach of all, and we trust that the increased use of gas will testify to your hearty indorsement of the reduction in rates."

AT the annual meeting of the shareholders of the Rome (N. Y.) Gas and Electric Light and Power Company the following Directors were elected: Edward Comstock, James T. Lynn, Martin B. Daly, Thomas H. Stryker, E. Saeger, F. K. Pelton, A. L. Wilkinson, R. A. Field and John D. McMahon.

WE are indebted to "F. A. L.," of Baltimore, Md., for the following notice which appeared in the Baltimore *News*, dated the 6th inst.: "News was received at the office of the Consolidated Gas Company this morning of the death of Mr. Edgar T. Powers, Secretary of the Company, at Richmond, Va., last night. Mr. Powers had been in poor health since last August, when he was operated on at the Union Protestant Infirmary, and he never recovered. Shortly before Christmas he went to the home of his parents, in Richmond, Va., to recuperate, but instead grew worse. Mr. Powers was in the thirtieth year of his age and was a gas engineer of considerable reputation. He was a graduate of the Stevens Institute, Hoboken, N. J., and for a time was with the United Gas Improvement Company. Before coming to Baltimore he was manager of a gas works at Lincoln, Neb. Mr. Powers became Secretary of the Consolidated Gas Company when it passed into the control of the present management, and in this capacity became very popular. Mr. Powers is survived by his parents, Mr. and Mrs. Robert W. Powers, and several brothers and sisters. He made his home with his uncle, Major W. Stuart Symington, while living in Baltimore."

THE New Orleans Lighting Company has determined to construct a gas plant at Algiers, which is just on the opposite bank of the Mississippi from New Orleans, and which has hitherto been supplied with gas by means of a high pressure, submerged pipe crossing the river from New Orleans. The scheme was all right, provided the grappling hooks of the river steamers could be kept out of the way. Manager Miller will have something to say about the change, in the shape of a set paper later on.

THE inquiry into the rates charged for the supply of gas and electricity by the Syracuse (N. Y.) Lighting Company will be commenced to-morrow before the State Commission of Gas and Electricity. Manager Cummins is ready and willing.

THE Plymouth, Ind., Council has granted a franchise to Mr. D. A. Douglas, of Angola, Ind., for the right to there operate a gas works. It is stipulated that the selling rate shall not exceed $1.35 per 1,000 cubic feet, with 10 cents per 1.000 off for prompt payment.

THREE RIVERS, MICH., is to have a gas works, and Detroit and Grand Rapids capitalists, prominent among whom is Mr. F. L. Hulswitt are behind the scheme.

MR. LESLIE C. MAINLAND is now in active charge of the Monmouth (Ills.) Company as to its works. Mr. Gilbert Kilpatrick remains in charge of the office staff.

MR. S. E. WOLFF has been elected a member of the Board of Directors of the Saginaw (Mich.) Gas Company.

"J. R. S," writing under date of the 9th inst, incloses the following: "Le Roy Gates, formerly employed by the Jackson (Mich.) Gas Company, recently resigned to accept a position on the force of the Bay City (Mich.) Gas Company. Preceding his changing of base his confreres presented him with a handsome signet ring."

THE Hopkinsville (Ky.) Company will rebuild its works this summer.

THE New Bedford (Mass.) Gas and Edison Light Company has withdrawn from membership in the New Bedford Board of Trade.

AT the annual meeting of the Kalamazoo (Mich) Gas Company the following officers were elected: Directors, H. D. Walbridge, H. B. Coleman, C. A. Peck, H. B. Osborne, Ira Ransome, Edward Woodbury, F. W. Blowers, J. J. Knight and J. W. Thompson; President, H. D. Walbridge; First Vice-President, J. J. Knight; Second Vice-President and General Manager, F. W. Blowers; Treasurer, D. H. Haines; Assistant Secretary and Treasurer, George E. Hardy.

MR. A. R HART incloses the following from Fitchburg, Mass., under date of the 9th inst: "The growing use of electric power in this city has been frequently spoken of in the *Sentinel*, and proof, if it were needed, may be mentioned in the action of the Directors of the Fitchburg Gas and Electric Light Company, who voted last week to double its electric power plant. When the new station was built, not very long ago, room was provided in which to meet just this contingency and expectation. It will increase the power from 1,000 kw. to 2,000 kw. and means the placing in operation of another generating unit, as the phrase is used in electrical parlance. The contracts for the machines have been agreed upon, and they are expected for delivery and installation in time for operation by new year. The Company has just put an illuminated sign 'Electric Power' over the entrance of its office and one of the windows is being fitted for an electrical display that will far exceed in interest anything ever before shown here. It will demonstrate the goods the Company has to sell fittings and fixtures that can be used, and other uses of electricity in everyday life. Walter L. Hibbard, late of Bruce & Hibbard has entered the employ of the Company in its electrical department. The Company is about to take up, at its own expense, the fitting of service connections in buildings on the lines of its conduits for service by pipes and wiring in the streets."

THE AMERICAN GAS LIGHT JOURNAL

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THOS. J. CUNNINGHAM, ELBERT P. CALLENDER, EDITORS.

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MONDAY, MARCH 19, 1906.

The Market for Gas Securities.

There is nothing much to say in respect to the value of New York gas securities this week, save that a certain investing concern sold its holdings; holdings that were held for many years—much over 50. However, we think they made a bad mistake, for the present holders will never let them go. The closing to-day was 143½ to 143¾.

The prices quoted for Brooklyn Union (134 to 135) are ridiculous. Peoples, of Chicago, seems a purchase at 94¼ to 95¼, and there is no doubt that both sorts of Laclede are purchases at the quoted prices.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

MARCH 19.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	143¼	143⅝
Central Union, Bonds, 5's	3,000,000	1,000	108	110
Equitable Bonds, 6's	1,000,000	1,000	..	105
" 1st Con. 5's	2,300,000	1 000	118	120
Mutual	3,500,000	100	275	290
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co.. Bonds, 5's	11,000,000	1,000	107	109
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg Gold Bds. 5 p. ct.	1,000,000	..	98	104
Northern Union, Bonds, 5's	1,250,000	1,000	105	107
New York and East River.. Bonds 1st 5's	3,500,000	1,000	112	114
" 1st Con. 5's	1,500,000	..	106¾	108½
tandard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
Bonds, 1st Mortgage, 5's	1,500,000	1,000	111	114
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	134	145
" " Bonds (5's)	15 000,000	1,000	112	113
Bay State	50,000,000	50	⅜	..
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	509,000	1,000	95	100
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
d " " "	3,000.000	1.000	47¼	50
Buffalo City Gas Co.	5,500,000	100	10	12
" Bonds, 5's	5,250.000	1,000	75	80
Capital, Sacramento	500.000	50	..	55
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,550,000	1,000	104	106¾
Cincinnati Gas and Electric Co	29,500,000	100	103¾	103
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	..	95
Preferred	3,026,500	100	107½	108
Consumers, Toronto	,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	..	87½
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	5 000 000	50	..	50
" Prior Lien 5's	4,618,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
" Bonds, 5's	10,500,000	..	110	110½
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	.	105
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	108½	109
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000.000	1,000	60	65
Louisville	4,570,000	50	143	145
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000 000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	94¾	95¼
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	104¼	105¼
San Francisco, Cal.	15,800,000	00	58½	58⅝
St. Joseph Gas Co. " 1st Mtg. 5's	751.000	1,000	98	..
St. Paul Gas Light Co	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension 6's	600.000	1,000	112½	115
General Mortgage, 5's	2,465.000	1,000	96¾	..
Syracuse, N. Y.	1,975.000	100	50	55
Bonds	2,047 000	1,000	102	..
Washington, D. C	2,600.000	20	303¾	304⅝
First mortgage 6's	600.000	..	..	..
Western, Milwaukee	4 000.000	..	..	..
Wilmington, Del	600.000	50	230	..

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SPECIAL NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, February 14, 1906.

The Annual Meeting of the Stockholders of The United Gas Improvement Company will be held at the office of the Company, Northwest Corner of BROAD AND ARCH STREETS, PHILADELPHIA, on Monday, May 7, 1906, at 12 o'clock, noon, for the purpose of electing a President and six Directors, to serve for the ensuing year, considering and acting upon the subject of a proposed increase in the capital stock of the company from 734,500 shares of the par value of $50 each, to 918,005 shares of the par value of $50 each, and transacting such other business as may properly come before the meeting. The stock transfer books will be closed from 3 P.M., April 25, until 9 A.M., May 8th, 1906.

By order of the Board of Directors.

1603-6 W. F. DOUTHIRT, Secretary.

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., March 14, 1906.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable April 14th, 1906, to stockholders of record at the close of business, March 31, 1906. Checks will be mailed.

1606-4 LEWIS LILLIE, Treasurer.

Position Wanted

As Manager or Superintendent by a Practical Gas and Electrical Engineer.

Nine years' successful operation of present property; 15 years' experience. Will be open for engagement April 1, 1906. Best of references from present company.

1601-6 Address, "G. B.," care this Journal.

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As Superintendent or Manager of a Gas Company,

By a young man having 10 years' experience in the manufacture, distribution, construction and management of two gas companies. Have been successful in developing business and reducing operating costs. Can guarantee great improvement in the management of a company which has not been paying satisfactory dividends.

Address, "C. J. L.,"

1605-2 Care this Journal.

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Young man of good appearance wants position as solicitor. Experienced, and can furnish best of references as to ability and character. Can sell any kind of gas appliance. Address, "A. S.,"

1606 1 Care W. R. Grant, 3720a Olive St., St. Louis, Mo.

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1603-tf Address, "PRACTICAL," care this Journal.

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One for gas and electric light and one for gas alone. Answer, stating experience and salary expected.

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1605-3 Care this Journal.

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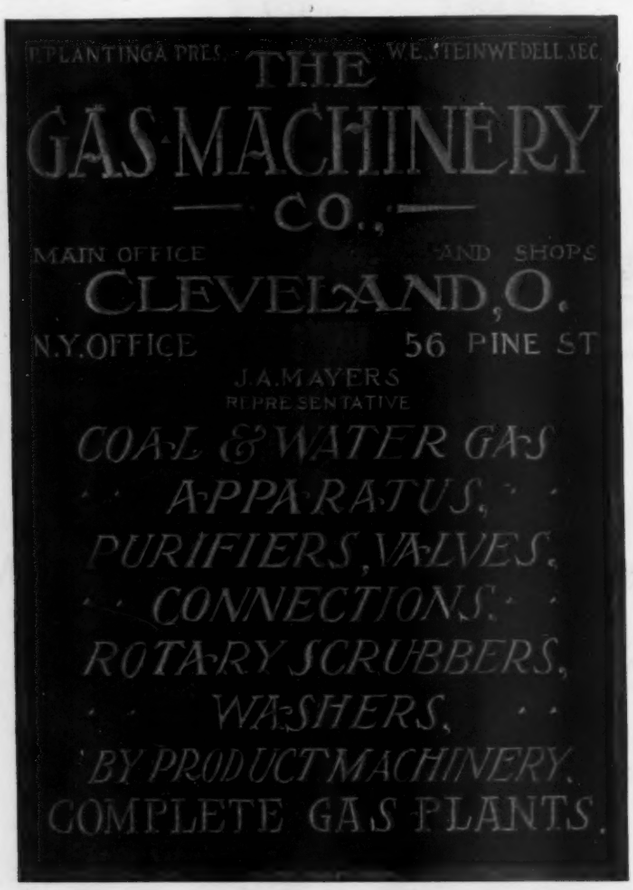

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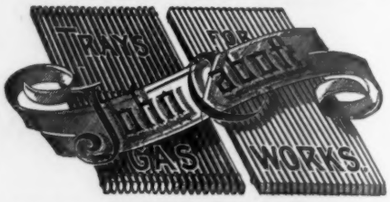

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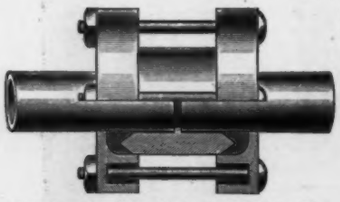
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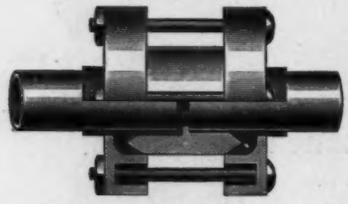
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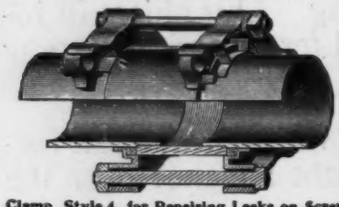
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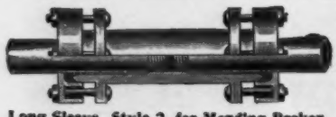
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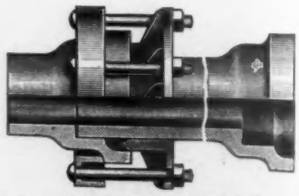
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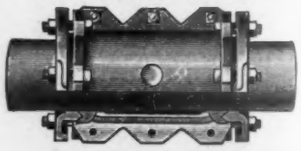
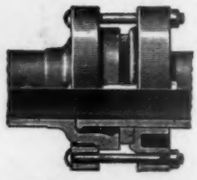
Split Sleeve for Repairing Broken Bell on Cast Iron Pipe.


Split Sleeve for Repairing Broken or Cracked Cast Iron Pipe.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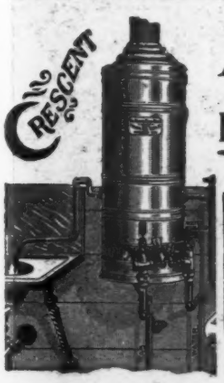

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" 1	34.00	¾ "	2	31 "	10¾ "	62 "
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" 8	23.50	½ "	2½	28½ "	10¾ "	48 "
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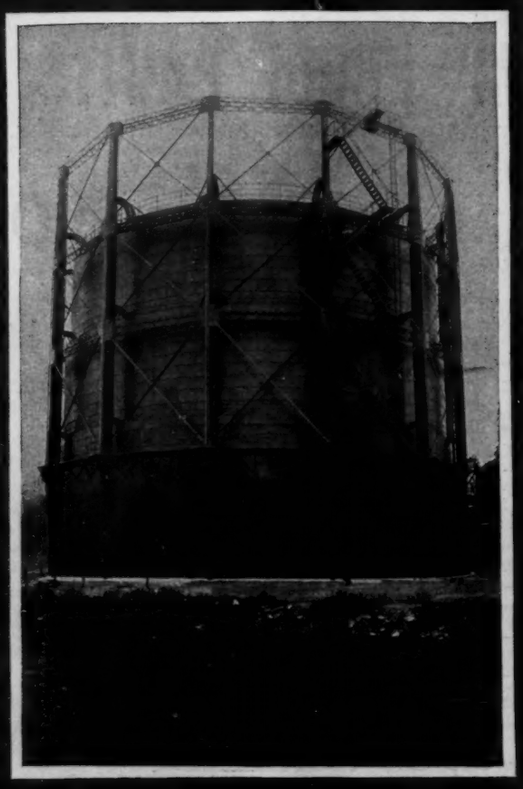

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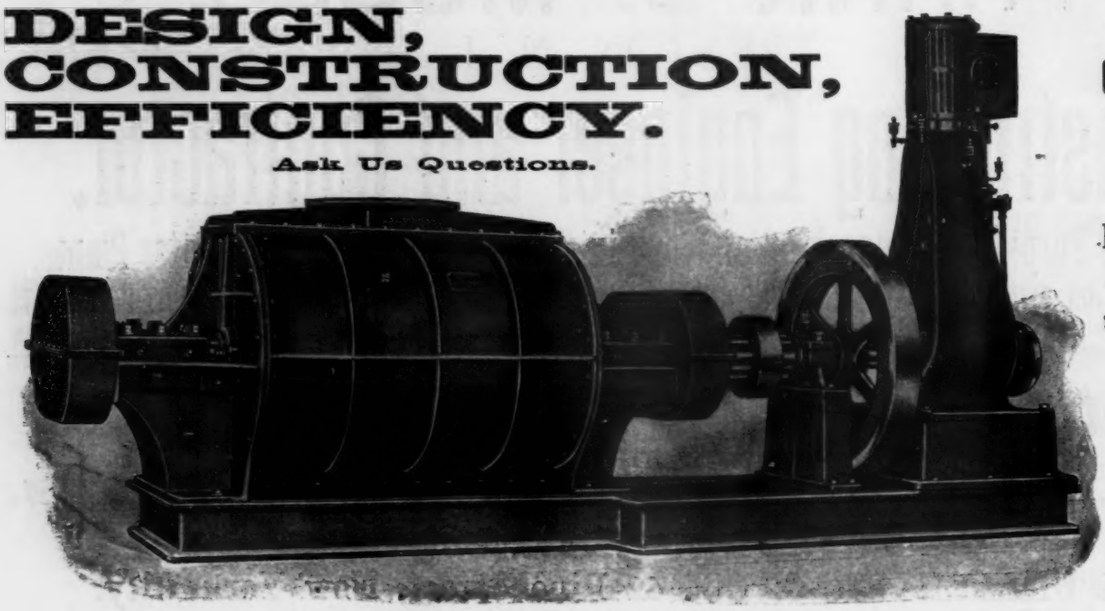

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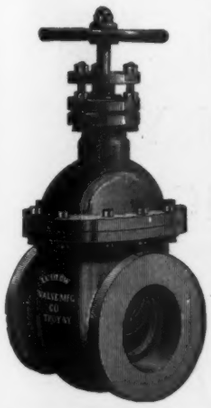

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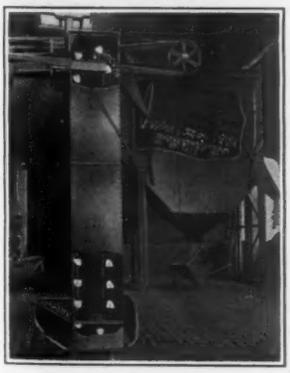

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This Computer solves the following formula, which is applicable to Gas, Air and other elastic fluids, flowing through long pipes with high initial pressures:

Discharge in cubic feet per hour at atmospheric pressure $= 33.3 \sqrt{\frac{d^5 \times (p_1^2 - p_2^2)}{L \times w}}$

Where

d = diameter of pipe in inches,
p_1 = absolute initial pressure in pounds per square inch,
p_2 = absolute terminal pressure in pounds per square inch,
L = length of pipe in miles,
w = specific gravity of the fluid when air = 1.

To Find the Discharge from a Pipe and the Required Size of Pipe.

(1.) Set the specific gravity of the fluid opposite the length of pipe;

(2.) Bring the DIFFERENCE of the initial and terminal gauge pressures opposite the SUM of the initial and terminal gauge pressures;

(3.) Opposite any diameter of pipe will now be found the discharge in cubic feet per hour at atmospheric pressure; and

(4.) Opposite any desired discharge will also be found the required diameter of pipe.

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ANGLE PATTERN.

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With Mueller Angle Gas Stove Cocks perpendicular connection is made with the fuel supply pipe by means of the coupling and nut at the bottom of the cock, while no fittings are required to connect the short angle with the range pipe, that piece being screwed directly to the angle. They permit the range to be set almost against the wall.

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Each cock is carefully inspected and assembled, is given a 75-pound hydraulic pressure test as near like actual service use as possible, bears the Mueller trade mark, and is *unconditionally guaranteed.*

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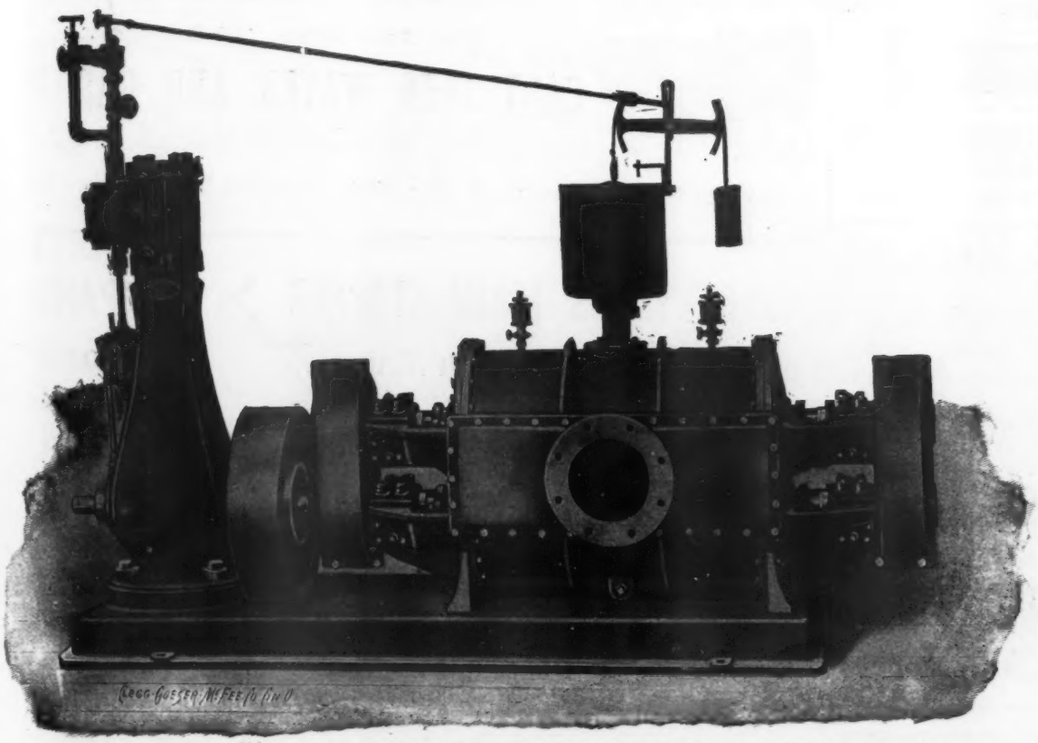

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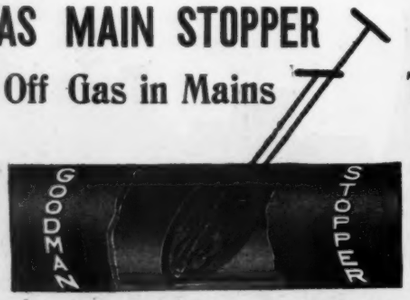

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Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

APRIL, 1906.

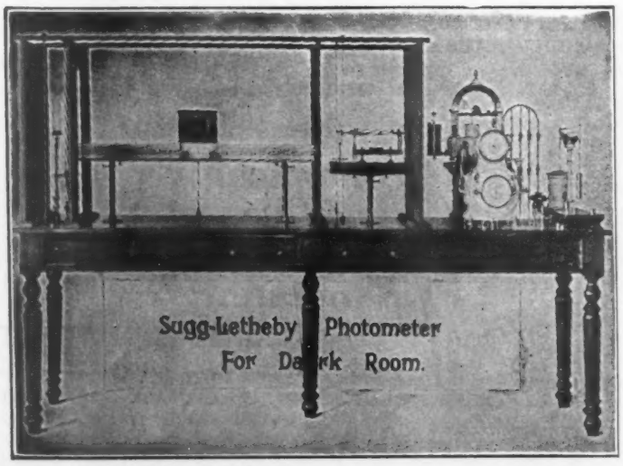
Table No. 1.
FOLLOWING THE MOON.

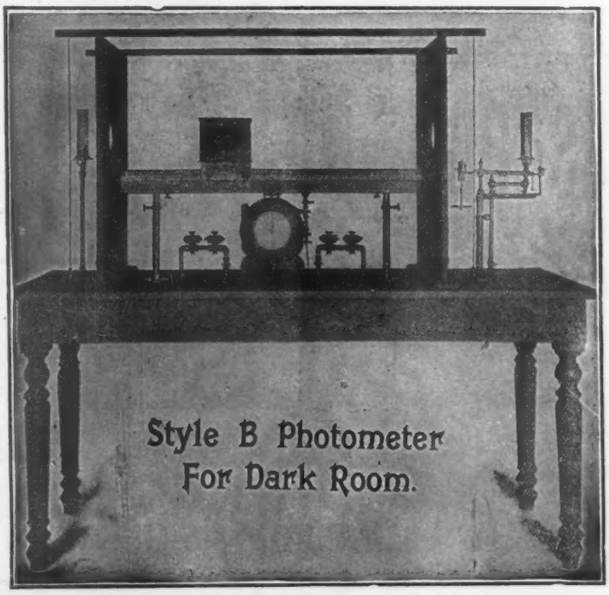
Day of Week.	Date.	Light.	Extinguish.
Sun.	1	12.30 AM PM	4.40 AM
Mon.	2	1.10	4.40
Tue.	3	2.00	4.40
Wed	4	2.40	4.40
Thu.	5	3 20	4.40
Fri.	6	3.50	4.40
Sat.	7	No L.	No L.
Sun.	8	No L FM	No L.
Mon.	9	No L.	No L.
Tue.	10	7.00 PM	9.20 PM
Wed.	11	7.00	10.40
Thu.	12	7.00	11.50
Fri	13	7.00	12.50 AM
Sat.	14	7.00	1.50
Sun	15	7.10 LQ	2.40
Mon.	16	7.10	3.20
Tue.	17	7.10	4.00
Wed.	18	7.10	4.20
Thu.	19	7.10	4.20
Fri.	20	7.10	4.20
Sat.	21	7.10	4.20
Sun.	22	7.20	4.10
Mon.	23	7.20 NM	4.10
Tue.	24	7.20	4.10
Wed.	25	7.20	4.10
Thu.	26	7.20	4.10
Fri.	27	7.20	4.10
Sat.	28	10.20	4.10
Sun.	29	11.10	4.00
Mon.	30	11 50	4.00

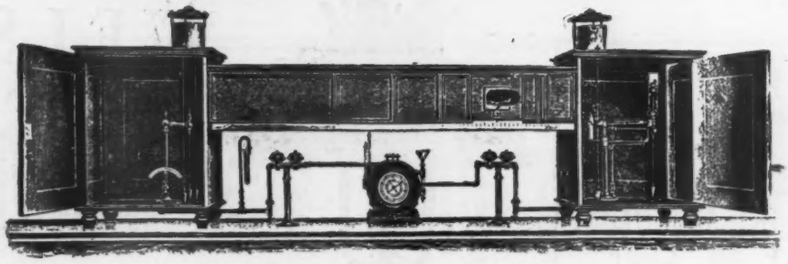
TOTAL HOURS DURING 1906.

By Table No. 1.

	Hrs.Min.
January	223.40
February	190.40
March	192.10
April	167.00
May	152.20
June	142.10
July	150.20
August	157.40
September	170.00
October	185.10
November	201.40
December	214.00
Total, yr.	2146.50







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

APRIL, 1906.

Table No. 2.
NEW YORK CITY.
ALL NIGHT LIGHTING.

Day of Week.	Date.	Light.	Extinguish.
		P. M.	A.M.
Sun.	1	6.10	4.55
Mon.	2	6.15	4.40
Tue.	3	6.15	4.40
Wed.	4	6.15	4.40
Thu.	5	6.15	4.40
Fri.	6	6.15	4.40
Sat.	7	6.15	4.40
Sun.	8	6.15	4.40
Mon.	9	6.25	4.30
Tue.	10	6.25	4.30
Wed.	11	6.25	4.30
Thu.	12	6.25	4.30
Fri.	13	6.25	4.30
Sat.	14	6.25	4.30
Sun.	15	6.25	4.30
Mon.	16	6.30	4.20
Tue.	17	6.30	4.20
Wed.	18	6.30	4.20
Thu.	19	6.30	4.20
Fri.	20	6.30	4.20
Sat.	21	6.30	4.20
Sun.	22	6.30	4.20
Mon.	23	6.40	4.10
Tue.	24	6.40	4.10
Wed.	25	6.40	4.10
Thu.	26	6.40	4.10
Fri.	27	6.40	4.10
Sat.	28	6.40	4.10
Sun.	29	6.40	4.10
Mon.	30	6.45	4.00

TOTAL HOURS DURING 1906.

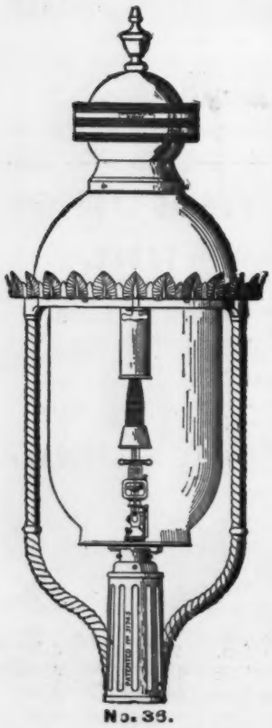
By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 318 West 42d Street. BOSTON, 820 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, 218 La Salle Street. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



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By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 33.

The Welsbach No. 6 Harp Fixture.

AN IDEAL LIGHT FOR DINING OR LIVING ROOMS.

THE HIGHEST MECHANICAL INGENUITY COMBINED WITH ORNAMENTAL BEAUTY--THE NEWEST OUTPUT FROM THE WELSBACH FACTORIES.

Equipped with new model No. 66 high candle power Welsbach Burner.

Side Pilot By-pass Tube covered with refractory sleeve to prevent bending.

Fourteen-inch Opal Dome Shade.

Polished Brass Embossed Crown 2¼ inches high.

Length of Fixture, 30 inches.

Width of Harp, 4½ inches.

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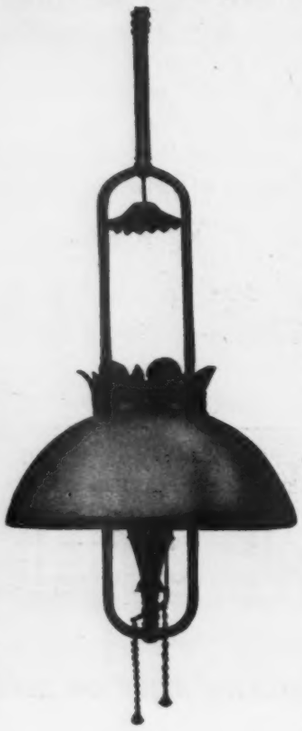

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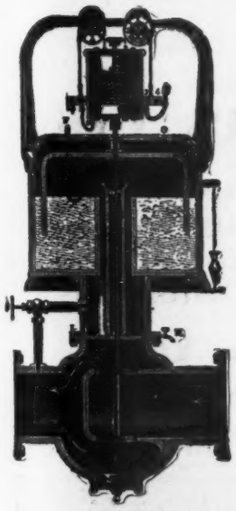

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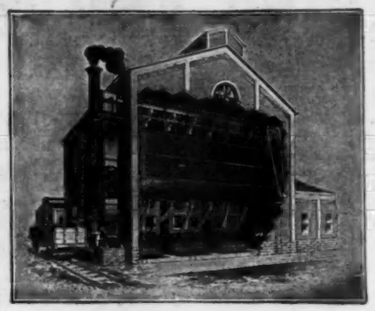

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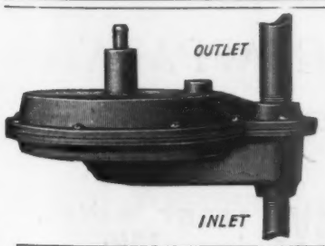

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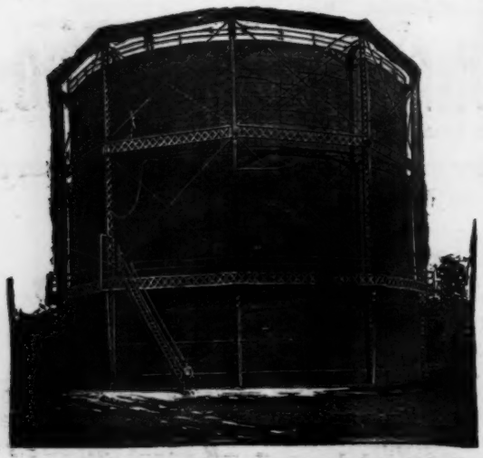

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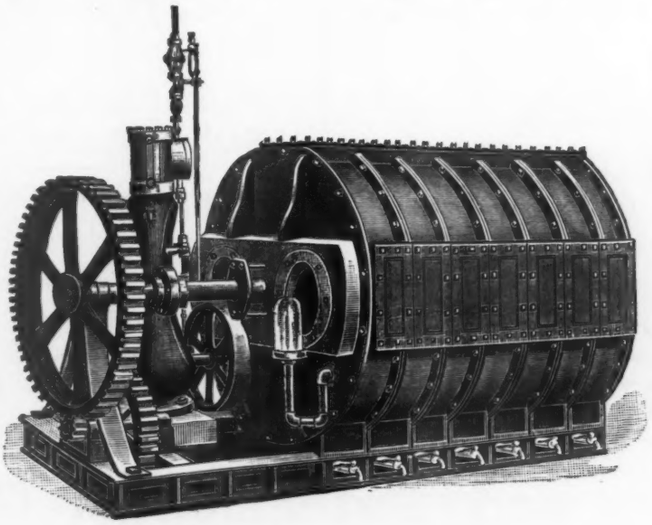

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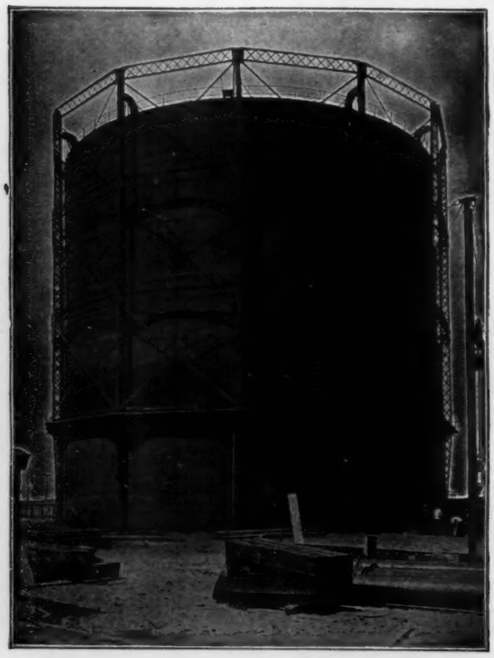

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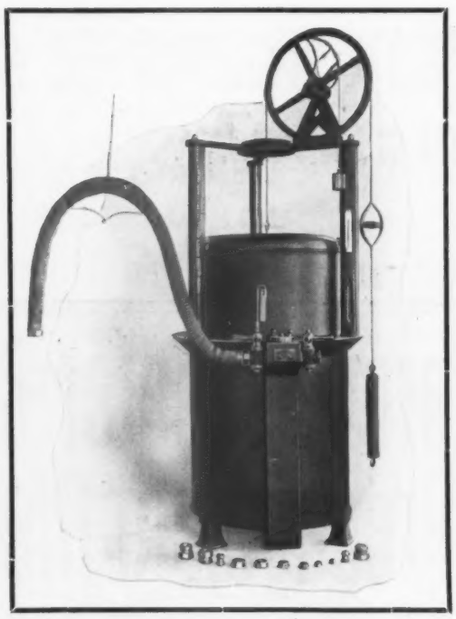

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70 PER CENT.

Of Our Output is

PREPAYMENT GAS METERS.

We have fitted up over 16,000 Idle, Regular Meters with our

PREPAYMENT ATTACHMENT.

Can be attached to any make of meter.

NATHANIEL TUFTS METER COMPANY, 8 MEDFORD STREET, BOSTON, MASS.

MARYLAND METER CO.,

BALTIMORE, North and Saratoga Streets. CHICAGO, 88 to 92 Jackson Boulevard.

CONSUMERS' AND STATION METERS, PRESSURE GAUGES, ETC.

SPECIAL ATTENTION GIVEN TO ALL REPAIR WORK.

"Have you Seen our Complaint Meter?"

WHEN YOU SEND REPAIRS TO US

They can be changed to Prepayment, Prepayment and Beal Straight-reading, or Beal Straight-reading only. Good job. Good time. Good people. Write us.

KEYSTONE METER CO., Royersford, Pa.

New York Improved Meter Co.'s Regular and Prepayment Meters are the best.

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Wet and Dry Gas Meters, Station Meters, Meter Provers,
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REGULAR METERS REFITTED WITH PREPAYMENT ATTACHMENTS.

HELME & McILHENNY,

Established 1848. **1339 to 1349 Cherry Street, Philadelphia, Pa.**

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Our Own Patents. Strong. Simple. PROMPT ATTENTION. CORRESPONDENCE SOLICITED.

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GAS METERS for NATURAL and ARTIFICIAL GAS.

Special Attention given to Repairing METERS of all Makes.

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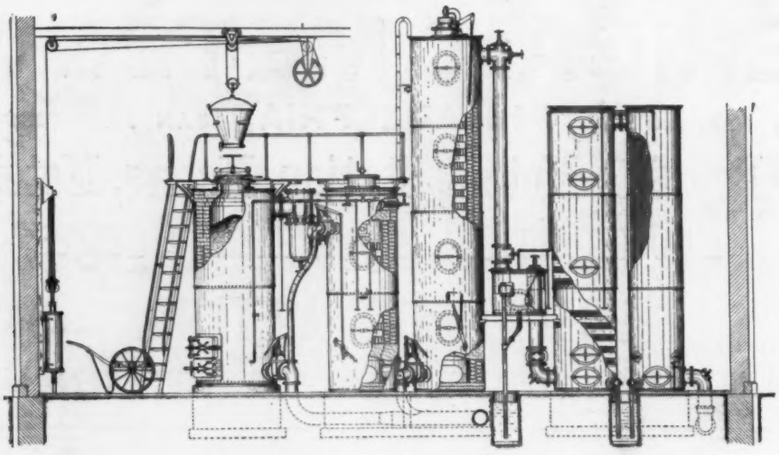

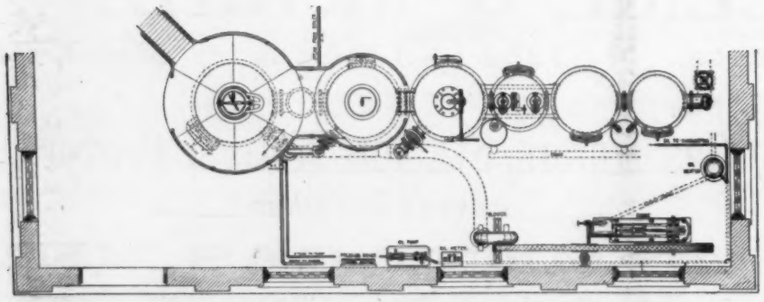

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AS AN AUXILIARY TO ITS COAL GAS APPARATUS

NEVER TIED UP BY A

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